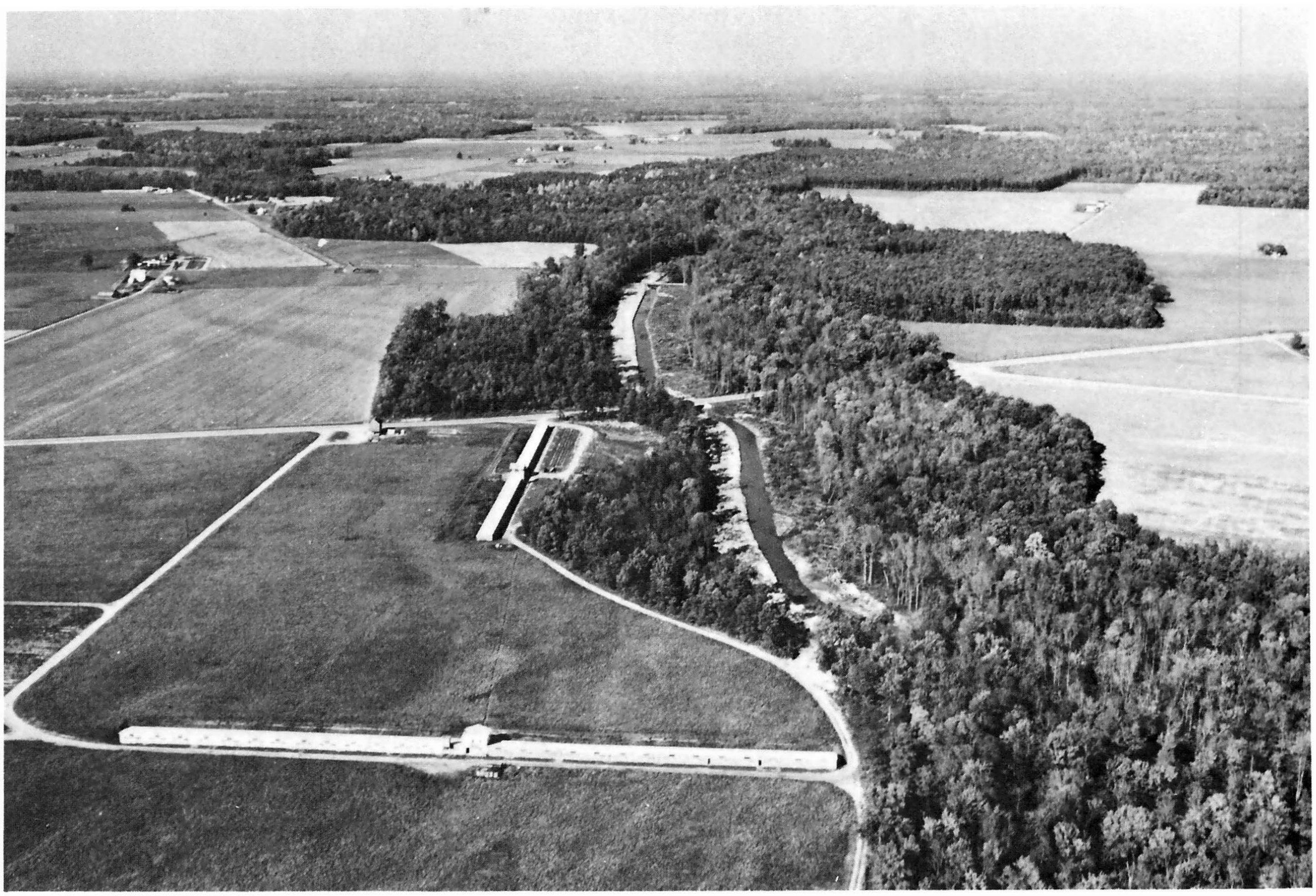
SOIL SURVEY OF

Sussex County, Delaware



United States Department of Agriculture
Soil Conservation Service
in cooperation with
Delaware Agricultural Experiment Station

Issued May 1974

Major fieldwork for this soil survey was done in the period 1944–70. Soil names and descriptions were approved in 1971. Unless otherwise indicated, statements in the publication refer to conditions in the county in 1971. This survey was made cooperatively by the Soil Conservation Service and the Delaware Agricultural Experiment Station. It is part of the technical assistance furnished to the Sussex County Soil and Water Conservation District.

Either enlarged or reduced copies of the soil map in this publication can be made by commercial photographers, or they can be purchased on individual order from the Cartographic Division, Soil Conservation Service, United States Department of Agriculture, Washington, D.C. 20250.

HOW TO USE THIS SOIL SURVEY

THIS SOIL SURVEY contains information that can be applied in managing farms and woodlands, in selecting sites for roads, ponds, buildings, and other structures; and in judging the suitability of tracts of land for farming, industry, residential development, and recreation.

Locating Soils

All the soils of Sussex County are shown on the detailed map at the back of this publication This map consists of many sheets made from aerial photographs. Each sheet is numbered to correspond with a number on the Index to Map Sheets.

On each sheet of the detailed map, soil areas are outlined and are identified by symbols. All areas marked with the same symbol are the same kind of soil. The soil symbol is inside the area if there is enough room; otherwise, it is outside and a pointer shows where the symbol belongs.

Finding and Using Information

The "Guide to Mapping Units" can be used to find information. This guide lists all the soils of the county in alphabetic order by map symbol and gives the capability and woodland classifications of each. It shows the page where each soil is described and the page for the capability unit in which the soil has been placed.

Individual colored maps showing the relative suitability or degree of limitation of soils for many specific purposes can be developed by using the soil map and the information in the text. Translucent material can be used as an overlay over the soil map and colored to show soils that have the same limitation or suitability. For example, soils that have a slight limitation for a given use can be colored green, those with a moderate limitation can be colored yellow, and those with a severe limitation can be colored red.

Farmers and those who work with farmers can learn about use and management of the soils from the soil descriptions and from the discussion of general management practices.

Foresters and others can refer to the section "Woodland," where the soils of the county are grouped according to their suitability for trees.

Game managers, sportsmen, and others can find information about the use of the soils as wildlife habitat in the section "Wildlife."

Community planners and others can read about soil properties that affect the choice of sites for residential and related uses and for recreation areas in the section "Town and Country Planning."

Engineers and builders can find, under "Engineering Uses of the Soils," tables that contain test data, estimates of soil properties, and information about soil features that affect engineering practices.

Scientists and others can read about how the soils formed and how they are classified in the section "Formation and Classification of the Soils."

County officials and others may be especially interested in the section "General Soil Map." This section describes broad patterns of soils and how they fit into the landscape and gives an overall picture of their suitabilities and limitations.

Cover: General view of the Evesboro-Rumford soil association (association 4), 2 miles east of Bridgeville. The cultivated areas are mostly Evesboro and Rumford soils, and the wooded areas mostly Fallsington soils. Association 4 makes up nearly half the land area of the county.

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SOIL SURVEY OF SUSSEX COUNTY, DELAWARE

BY WILLIAM IRELAND, JR., AND EARLE D. MATTHEWS, SOIL CONSERVATION SERVICE

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UNITED STATES DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE, IN COOPERATION WITH THE DELAWARE AGRICULTURAL EXPERIMENT STATION

SUSSEX COUNTY is the southernmost of the three counties in Delaware (fig. 1). It has a land area of approximately 605,440 acres, or 946 square miles George-town, near the center of the county, is the county seat. Other important towns are Bethany Beach, Bridgeville, Dagsboro, Frankford, Laurel, Lewes, Milford, Millville, Milton, Rehoboth Beach, Seaford, and Selbyville. There are some smaller towns and villages.

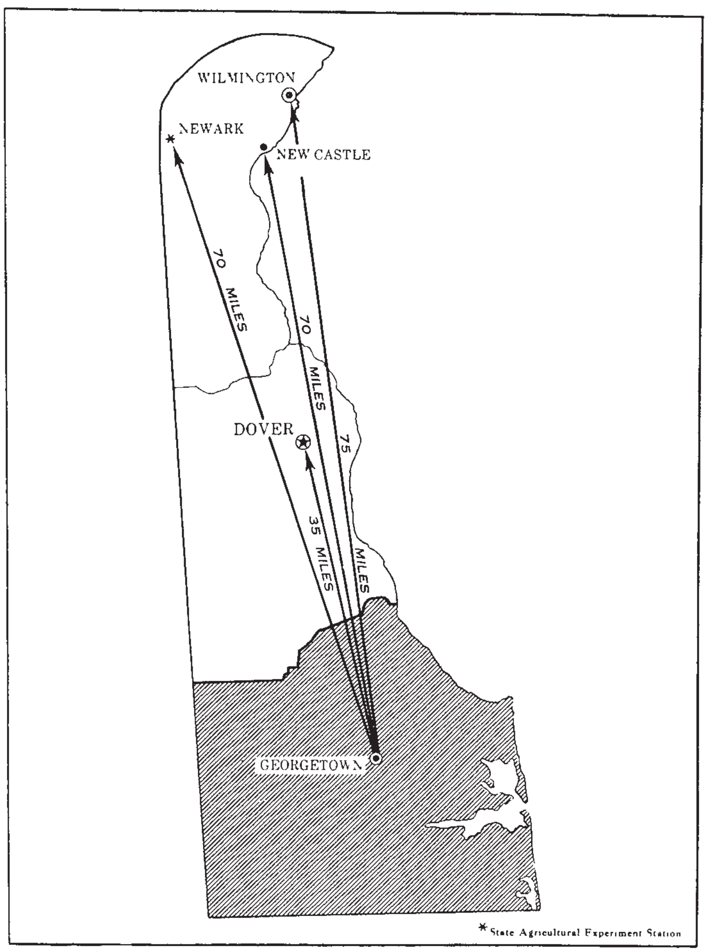

Figure 1.—**Location of Sussex County in Delaware.**

Most of the soils of the county are well suited to a wide variety of farm uses, and some are well suited to most nonfarm uses. About 93 percent of the land area is suited to more or less intensive farming. The rest is mostly marsh, swamp, and beach.

Natural wetness and sandiness are the main overall limitations in soil management for farming. About 45 percent of the acreage suited to farming needs some artificial drainage. About 43 percent is moderately to severely limited by sandiness and low available moisture capacity. Only about 2 percent is limited mainly by the hazard of erosion; the hazard is severe only locally. The remaining 10 percent of the acreage suited to farming has no important limitations and needs no special management.

The climate of the county is favorable for general farming, for raising poultry and livestock, and for growing truck crops, small fruits, orchard fruits, and woodland products. Soybeans and corn are the most extensively planted general crops. The more important truck crops are asparagus, cantaloups, carrots, cucumbers, lima beans, English peas, peppers, snap beans, squash, sweet corn, tomatoes, and watermelons. Blueberries and orchard crops are important locally.

Sussex County is well located in relation to markets for farm products. Wilmington, the largest city in the State, is an important market. Philadelphia, Baltimore, Washington, Norfolk, and New York are within reasonable distances.

The marshy areas of the county attract very large numbers of migratory waterfowl. Urban areas are not extensive, but residential areas are expanding considerably, especially adjacent to and near the Atlantic beaches.

General Nature of the County

Sussex County is entirely within the Atlantic Coastal Plain. It is mostly mainland, but the immediate Atlantic coast consists of sandy barrier reefs and some attached marshes. Marshland fringes all the land along Delaware Bay, except at Lewes, and extends inland along tidal streams. It also fringes Rehoboth Bay, Indian River Bay, and Little Assawoman Bay and extends up some of the tributary streams. Another area of marshland is west of Bethel, along the Nanticoke River. The elevation gradu-

ally increases from sea level in the east, westward to the watershed between the Atlantic Ocean and Chesapeake Bay. The highest point, about 78 feet, is on this watershed just west of Whitteville, which is in the southern part of the county near the Maryland State line. Westward from this watershed the elevation decreases to a little less than 10 feet where the Nanticoke River crosses the Maryland State line

The Atlantic-Chesapeake watershed line divides the county roughly into two parts To the east the county is drained into the Atlantic Ocean or into Delaware Bay by many streams. The largest of these streams, from north to south, are the Mispillion River, Cedar Creek, Slaughter Creek, Primehook Creek, Broadkill Creek, Red Mill Creek, Love Creek, Herring Creek, the Indian River, Pepper Creek, Blackwater Creek, Derricksons Creek, Miller Creek, Evans Creek, and Bear Hole Creek.

Most of the drainage west of the watershed line is through the Nanticoke River and its major tributaries, including Tantrough Branch, Clear Brook, Bucks Branch, Chapel Branch, Gum Branch, Gravelly Fork, Gravelly Branch, Deep Creek, Elliot Pond Branch, James Branch, Meadow Brook, and Mill Creek. Cedar Swamp, in the southern part of the county, drains across the Maryland State line into the Pocomoke River. The extreme northwestern part of the county drains toward Chesapeake Bay through Marshyhope Creek.

All of Sussex County but the marshlands and beaches was once covered chiefly with hardwoods. Oak is now dominant on the better drained soils, and some species of oak are abundant in wet areas Other wetland trees include red maple, sweetgum, blackgum, holly, sweetbay, dogwood, beech, and birch Locally there were once good stands of redcedar and cypress, but few remain Virginia pine has invaded some areas, particularly areas of the more droughty soils. Some pond pines grow in wet areas. Sussex County is about the northern limit of the natural range of loblolly pine. This tree is abundant in many areas, particularly in cutover and second-growth woodland.

Sussex County is mostly rural and agricultural, but many small industries use agricultural and woodland products. The Atlantic beach area, from Cape Henlopen south to the Maryland State line, has rapidly expanding recreational and part-time residential development and is a favored vacation area for many summer visitors and tourists.

Modern highways and good secondary roads cross the county in nearly all directions. The principal north-south highways are U S 13 and U.S. 113.

Until the early part of this century, agriculture was dominated by cash-grain crops and general farming Since about 1910 the production of truck crops has increased steadily, largely on acreage formerly used for small grain. Large-scale production of Irish potatoes began about 1940, particularly in the northeastern part of the county, but much of the area once in potatoes has been converted to other truck crops and to corn and soybeans

Following the acceleration of the program of drainage improvement, and especially since about 1955, the acreage of tilled crops, chiefly corn and soybeans, has expanded in the western part of the county.

Climate[1]

Sussex County is in the middle latitudes where the general flow of the atmosphere from west to east favors a continental type of climate and four well-defined seasons. The Atlantic Ocean has a considerable moderating control on the climate in all seasons, especially in moderating extreme temperatures of adjacent areas. During the colder half of the year, a frequent succession of high- and low-pressure systems move along this west-to-east flow. The alternate surges of cold dry air from the north and warm humid air from the south account for much of the variety in the daily weather. This pattern tends to break down in summer, as warm moist air spreads northward from the south and southwest and remains over the area much of the time.

Data in table 1 are based on climatic records at Bridgeville, in the northwestern part of the county; they are fairly representative of the county except for the immediate coastal areas. Where reference is made to coastal areas, the data are based on records from the weather station at Lewes.

The warmest period of the year is the last of July, when the maximum afternoon temperature averages 89° F., except along the coast, where it is nearer 85°. A temperature of 90° or higher occurs on an average of 31 days per year, except along the coast, where it is only 19 days. The coldest period is the end of January and the beginning of February, when the early morning minimum temperature averages 24° at Bridgeville and 26° at Lewes. The average annual number of days when the minimum temperature is 32° or lower ranges from 101 at Bridgeville to 93 at Lewes. The highest recorded temperature, 110°, was at Millsboro on July 21, 1930. The lowest recorded temperature, −17°, was also at Millsboro, on January 17, 1893.

The average date of the last occurrence of minimum temperature equal to or below a specified threshold in spring and the first in fall is shown in table 2. The period between the occurrence of the last frost in spring and the first in fall, often defined as the growing season, averages 182 days at Bridgeville and 196 days at Lewes.

The average annual precipitation is 45 inches. The monthly distribution is fairly uniform throughout the year, but the maximum is in August Most precipitation in the colder half of the year is the result of low-pressure systems, moving northward or northeastward along the coast, while in summer it occurs as showers and thunderstorms. Seasonal snowfall averages 16 inches.

Drought can occur in any month, but serious drought is more likely in summer. Generally, rainfall and the stored soil moisture are adequate for good crop yields. Unequal distribution of summer showers and occasional dry periods at critical stages of crop development make irrigation necessary for maximum crop yields in some years.

Thunderstorms occur on an average of 30 days per year, mainly during the period May through August. Tornadoes are rare and have in the past caused little damage. Tropical storms or hurricanes affect the county about once a year, usually from August through October. They are accompanied by strong gusty winds, high tides,

[1] By W. J. MOYER, climatologist for Maryland and Delaware, National Weather Service, NOAA, College Park, Md.

TABLE 1.—*Temperature and precipitation, Bridgeville, Del.*

[Elevation 50 feet Period of record 1931–60, unless otherwise indicated]

Month	Temperature				Precipitation				
	Average daily maximum	Average daily minimum	Two years in 10 will have at least 4 days with—[1]		Average total	One year in 10 will have—		Days with snow cover 1 inch or more[2]	Average depth of snow on days with snow cover 1 inch or more[2]
			Maximum temperature equal to or higher than—	Minimum temperature equal to or lower than—		Less than—	More than—		
	°F	°F	°F	°F	Inches	Inches	Inches	Number	Inches
January	45.9	27.1	65	13	3.54	1.5	6.7	4	3
February	47.4	26.8	66	14	2.89	1.6	4.4	4	3
March	54.5	32.7	71	19	3.98	1.9	6.1	2	4
April	65.7	41.5	83	30	3.43	2.1	4.9		
May	75.7	51.6	87	39	3.78	1.3	6.8		
June	83.8	60.5	93	48	3.60	1.6	5.9		
July	87.3	65.1	95	55	5.06	2.0	10.2		
August	85.5	63.5	94	51	5.55	2.0	11.4		
September	79.9	56.9	90	43	4.02	1.0	8.8		
October	69.9	46.1	83	34	3.19	1.4	6.3		
November	58.7	36.3	72	24	3.21	1.2	5.3	(3)	
December	47.6	27.9	64	14	3.03	1.4	5.0	3	3
Year	66.8	44.7	[4] 98	[5] 5	45.28	36.5	55.2	13	3

[1] Period of record 1946–60
[2] Period of record 1941–70
[3] Only one snowfall has been recorded in November, a total of 7 inches in 1967.
[4] Average annual maximum
[5] Average annual minimum

and heavy rainfall, but most of them cause only minor damage

Prevailing winds are from west to northwest, except during the summer months, when they become more southerly. The average annual windspeed is about 9 miles per hour, but winds may reach 50 to 60 miles per hour or even higher during summer thunderstorms, hurricanes, or intense winter storms.

How This Survey Was Made

Soil scientists made this survey to learn what kinds of soil are in Sussex County, where they are located, and how they can be used. The soil scientists went into the county knowing they likely would find many soils they had already seen and perhaps some they had not. They observed the steepness, length, and shape of slopes; the size and speed of streams; the kinds of native plants or crops; and many facts about the soils. They dug many holes to expose soil profiles. A profile is the sequence of natural layers, or horizons, in a soil; it extends from the surface down into the parent material that has not been changed much by leaching or by the action of plant roots.

The soil scientists made comparisons among the profiles they studied, and they compared these profiles with those in counties nearby and in places more distant. They classified and named the soils according to nationwide, uniform procedures. The *soil series* and the *soil phase* are the categories of soil classification most used in a local survey.

Soils that have profiles almost alike make up a soil series. Except for different texture in the surface layer, all the soils of one series have major horizons that are similar in thickness, arrangement, and other important characteristics. Each soil series is named for a town or other geographic feature near the place where a soil of that series was first observed and mapped. Klej and Sassafras, for example, are the names of two soil series. All the soils in the United States that have the same series name are essentially alike in those characteristics that affect their behavior in the undisturbed landscape.

Soils of one series can differ in texture of the surface layer and in slope, degree of erosion, or some other characteristic that affects use of the soils by man On the basis of such differences, a soil series is divided into phases. The name of a soil phase indicates a feature that affects management. For example, Sassafras loam, 2 to 5 percent slopes, is one of several phases within the Sassafras series.

After a guide for classifying and naming the soils had been worked out, the soil scientists drew the boundaries of the individual soils on aerial photographs, These photographs show woodlands, roads, buildings, field borders, trees, and other details that help in drawing boundaries accurately. The soil map at the back of this publication was prepared from such aerial photographs.

The areas shown on a soil map are called mapping units. On most maps detailed enough to be useful in planning the management of farms and fields, a mapping unit is nearly equivalent to a soil phase. It is not exactly equivalent, because it is not practical to show on such a map all the small, scattered bits of soil of some other kind that have been seen within an area that is dominantly of a recognized soil phase.

In most areas surveyed there are places where the soil material cannot be classified and placed in a soil series.

TABLE 2.—*Probability of last freezing temperature in spring and first in fall*

[Data based on observations at Bridgeville (1 mile northwest) during the period 1926–55 and at Lewes during the period 1945–70]

BRIDGEVILLE

Probability	Dates for given probability and temperature		
	32° F. or lower	24° F or lower	16° F or lower
Spring			
9 years in 10 later than	April 5	March 8	February 5
3 years in 4 later than	April 13	March 15	February 14
2 years in 3 later than	April 16	March 17	February 17
1 year in 2 later than	April 22	March 22	February 24
1 year in 3 later than	April 28	March 27	March 3
1 year in 4 later than	May 1	March 29	March 6
1 year in 10 later than	May 9	April 5	March 15
Fall:			
1 year in 10 earlier than	October 7	October 29	November 23
1 year in 4 earlier than	October 14	November 6	November 30
1 year in 3 earlier than	October 16	November 9	December 3
1 year in 2 earlier than	October 21	November 15	December 8
2 years in 3 earlier than	October 26	November 21	December 13
3 years in 4 earlier than	October 28	November 24	December 16
9 years in 10 earlier than	November 4	December 2	December 23

LEWES

Probability	32° F. or lower	24° F or lower	16° F or lower
Spring			
9 years in 10 later than	April 1	March 6	(1)
3 years in 4 later than	April 7	March 12	(1)
2 years in 3 later than	April 9	March 15	(1)
1 year in 2 later than	April 13	March 19	(1)
1 year in 3 later than	April 17	March 23	(1)
1 year in 4 later than	April 19	March 26	(1)
1 year in 10 later than	April 25	April 1	(1)
Fall			
1 year in 10 earlier than	October 11	November 8	(1)
1 year in 4 earlier than	October 18	November 15	(1)
1 year in 3 earlier than	October 20	November 18	(1)
1 year in 2 earlier than	October 25	November 23	(1)
2 years in 3 earlier than	October 30	November 28	(1)
3 years in 4 earlier than	November 1	December 1	(1)
9 years in 10 earlier than	November 8	December 8	(1)

[1] Probability not calculated, because temperature of 16° F or lower did not occur every year

These places are shown on the soil map and are described in the survey, but they are called land types and are given descriptive names. Tidal marsh, salty, is a land type in this county.

While a soil survey is in progress, soil scientists take soil samples needed for laboratory measurements and for engineering tests. Laboratory data from the same kind of soil in other places are also assembled. Data on yields of crops under defined practices are assembled from farm records and from field or plot experiments on the same kind of soil. Yields under defined management are estimated for all the soils.

Soil scientists observe how soils behave when used as a growing medium for native and cultivated plants and as material, foundations, or covering for structures. They relate this behavior to properties of the soils. For example, they observe that filter fields for onsite disposal of sewage fail on a given kind of soil, and they relate this to slow permeability or a high water table. They see that streets and road pavements crack on a given kind of soil, and they relate this failure to frost action. Thus, they use observation and knowledge of soil properties, together with available research data, to predict the limitations or suitability of a soil for present and potential uses.

After data have been collected and tested for the key, or benchmark, soils in a survey area, the soil scientists set up trial groups of soils. They test these groups by further study and by consultation with farmers, agronomists, engineers, and others. They then adjust the groups according to the results of their study and consultation. Thus, the groups that are finally evolved reflect up-to-date knowledge of the soils and their behavior under current methods of use and management.

General Soil Map

The general soil map at the back of this publication shows, in color, the soil associations of Sussex County. A soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one less extensive soil, and it is named for the major soils. The soils of one association may occur in another, but in a different pattern or proportion.

A map showing soil associations is useful to people who want a general idea of the soils of a county, who want to compare different parts of a county, or who want to know the location of large tracts that are suitable for a certain kind of land use Such a map is a useful general guide in managing a watershed, a wooded tract, or a wildlife area or in planning engineering works, recreational facilities, and community developments. It is not a suitable map for planning the management of a farm or field or for selecting the exact location of a road, building, or similar structure, because the soils in any one association ordinarily differ in slope, depth, sandiness, drainage, and other characteristics that affect their management.

Soil associations and delineations on the general soil map of Sussex County do not fully agree with those on the general soil map of adjacent counties published at different dates Differences in the maps are the result of improvements in the classification of soils, particularly in the modifications or refinements in soil series concepts. In addition, more precise and detailed maps are needed because the uses of general soil maps have expanded in recent years. Still another difference is caused by the range of slope that is permitted within associations in different surveys

The nine soil associations in Sussex County are described in the following pages.

1. Tidal marsh, salty-Coastal beach and dune land association

Low areas that are regularly flooded by salt water, and areas of loose, salty beach and dune sands

Association 1 is at the eastern edge of the county, in both large and small areas that border Delaware Bay, the Atlantic Ocean, Rehoboth Bay, Indian River Bay, and Little Assawoman Bay It also extends inland for considerable distances along tidal streams.

This association occupies about 5 percent of the total land area of the county. It is about 80 percent Tidal marsh, salty; about 15 percent Coastal beach and dune land; and 5 percent less extensive soils.

Tidal marsh, salty, is open grassy marsh dissected by tidal streams and crisscrossed in places by shallow mosquito-control ditches In many places there is a brush border adjacent to higher ground. The material in the marsh is mostly peaty or mucky remains of vegetation, but it includes some loamy soil material that contains a large amount of sulfate The marshes range from strongly saline near the coast to brackish or almost fresh along the upper reaches of streams.

The Coastal beach and dune land part of this association consists of shifting, loose, salty beach sand that is moved about by waves and wind. The part regularly washed by waves and tides is smooth and slopes gently up from the water. That part above normal high tide is dunes and hummocks that are more or less constantly changed by the wind The vegetation is a sparse cover of beach grass, a few forbs, and scattered low shrubs.

Figure 2 shows the general appearance of association 1, and figure 3 shows a typical pattern of soils and underlying material.

The beaches and dunes are used intensively for summer recreational activity and as sites for beach cottages. The marshes are on the Atlantic flyway of migratory waterfowl. The Primehook National Wildlife Refuge is located in this association in a large area adjacent to Delaware Bay. Recreational activities in the marshes include waterfowl hunting, crabbing, and fishing. Limitations are severe for nearly all other uses.

Less extensive in this association are Fallsington, Klej, Osier, and Rutlege soils and important local areas of Fill land.

2. Tidal marsh, fresh, association

Low areas that are regularly flooded by fresh-water tides

Association 2 occurs as one small area at the western edge of the county, along the Nanticoke River and Broad Creek west of Bethel. It consists of tidal mudflats that have a vegetative cover of cattails and other plants that thrive in fresh water.

This association occupies less than 0.1 percent of the total land area of the county. It is about 90 percent Tidal marsh, fresh, and 10 percent Johnston soils and Swamp.

Tidal marsh, fresh, is largely muck or peat about 2 to 14 feet thick over sand. It is very soft and has a very low bearing capacity. Use is limited to wildlife habitat and such recreational activities as waterfowl hunting and fishing. Small areas have been filled for other uses. The streams are navigable by boats and small freighters and tankers.

3. Sassafras-Fallsington association

Well-drained and poorly drained soils that have a moderately permeable subsoil of sandy loam to sandy clay loam

Most of association 3 is in the eastern part of the county, in broad, discontinuous areas that are more or less parallel to Delaware Bay and extend from Milford to Rehoboth Beach. Smaller areas occur just north of Gravel Hill and around Bridgeville. The landscape is one of a broad plain, some shallow depressions, and a few streams (fig. 4). Most of the acreage is cultivated.

This association occupies about 10 percent of the total land area of the county. It is about 62 percent Sassafras soils, 15 percent Fallsington soils, and 23 percent less extensive soils.

Sassafras soils have a surface layer of grayish-brown sandy loam or loam and a subsoil of strong-brown sandy clay loam or heavy sandy loam. In most areas they are nearly level to gently sloping, but in places slopes are as much as 15 percent. These soils are moderately permeable and well drained.

Fallsington soils have a surface layer of gray to dark grayish-brown sandy loam or loam and a subsoil of gray or light-gray heavy sandy loam or sandy clay loam. They are nearly level, moderately permeable, and poorly drained. The water table is at or near the surface for long periods during the year.

Less extensive in this association are Johnston, Klej, Pocomoke, Rumford, and Woodstown soils. Johnston soils are on flood plains. The rest occur mostly as small

Figure 2.—General view of association 1, just south of Dewey Beach. Dune land in foreground has been partly stabilized by planting beach grass.

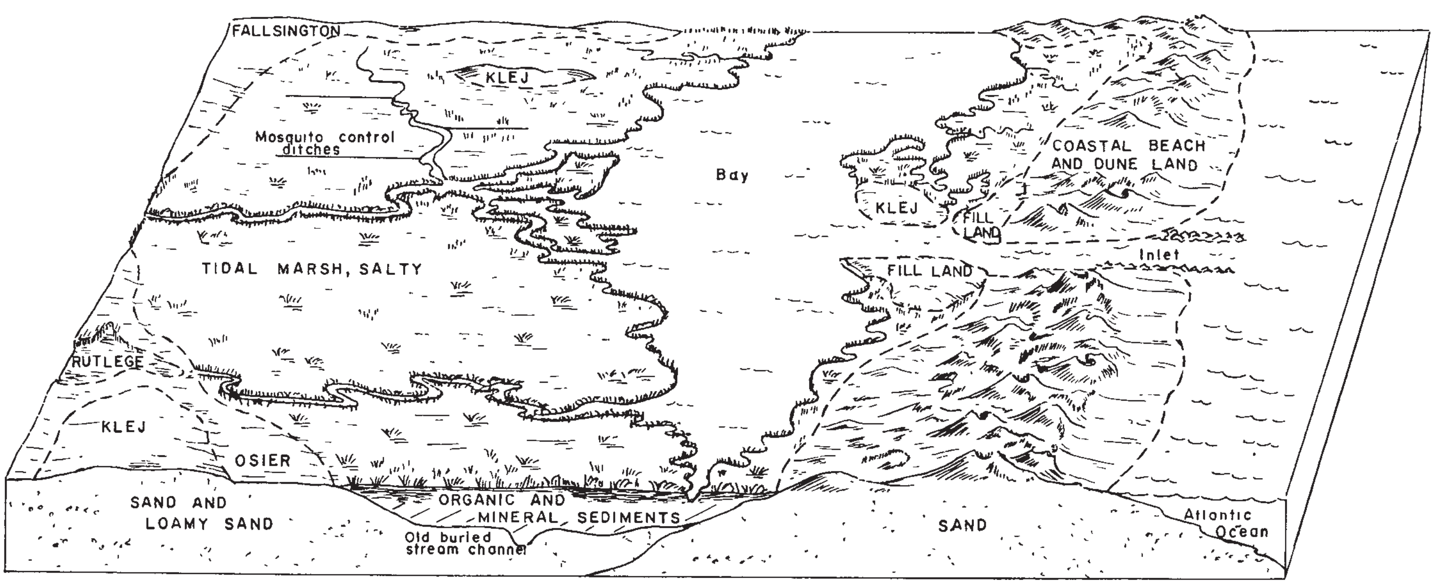

Figure 3.—Typical pattern of soils and underlying material in association 1.

Figure 4.—**General view of association 3, just north of Bridgeville. Cleared areas are chiefly Sassafras and Fallsington soils. The wooded area is chiefly Johnston soils.**

spots within areas of the major soils and do not appreciably affect overall land use.

Sassafras soils are generally the best soils in the county for farming. They have slight limitations for residential, commercial, and industrial development. Fallsington soils are suited to farming if they are artificially drained. They are used intensively for corn and soybeans. Undrained areas are mostly woodland. Limitations are severe for most nonfarm uses.

4. *Evesboro-Rumford association*

Excessively drained and somewhat excessively drained soils that have a rapidly permeable subsoil of sand to sandy loam

Association 4 is in two large areas. One extends from west of Milford south through Harbeson and Millsboro to Dagsboro and then east almost to the coast. It passes east of Ellendale and Georgetown and surrounds Indian River Bay and part of Rehoboth Bay. The other area is in the west-central and southwestern parts of the county. It surrounds Seaford and Laurel and includes most of the Nanticoke River watershed except the headwater flats. The landscape is mostly nearly level or gently sloping (see cover picture), but locally there are moderately sloping, dunelike ridges, some depressions and potholes, and steeper slopes bordering some major streams.

This is the most extensive association in the county. It occupies about 47 percent of the total land area. It is about 58 percent Evesboro soils, 18 percent Rumford soils, and 24 percent less extensive soils.

Figure 5 shows a typical pattern of soils and underlying material in this association.

Evesboro soils are droughty. They have a surface layer and subsoil of loamy sand or sand. In large areas there is a finer textured underlying layer at a depth of 40 to 72 inches. This material tends to hold moisture for deep-rooted crops, and yields are commonly higher in these areas than where the finer textured layer does not occur within 6 feet of the surface.

Rumford soils are somewhat droughty. They have a thick surface layer of loamy sand and a thin subsoil of strong-brown to yellowish-red sandy loam.

Less extensive in this association are Fallsington, Kalmia, Kenansville, Klej, Osier, and Sassafras soils. The poorly drained Fallsington soils are the most extensive and, along with Klej and Osier soils, occupy the many, commonly small, wet areas included in this association.

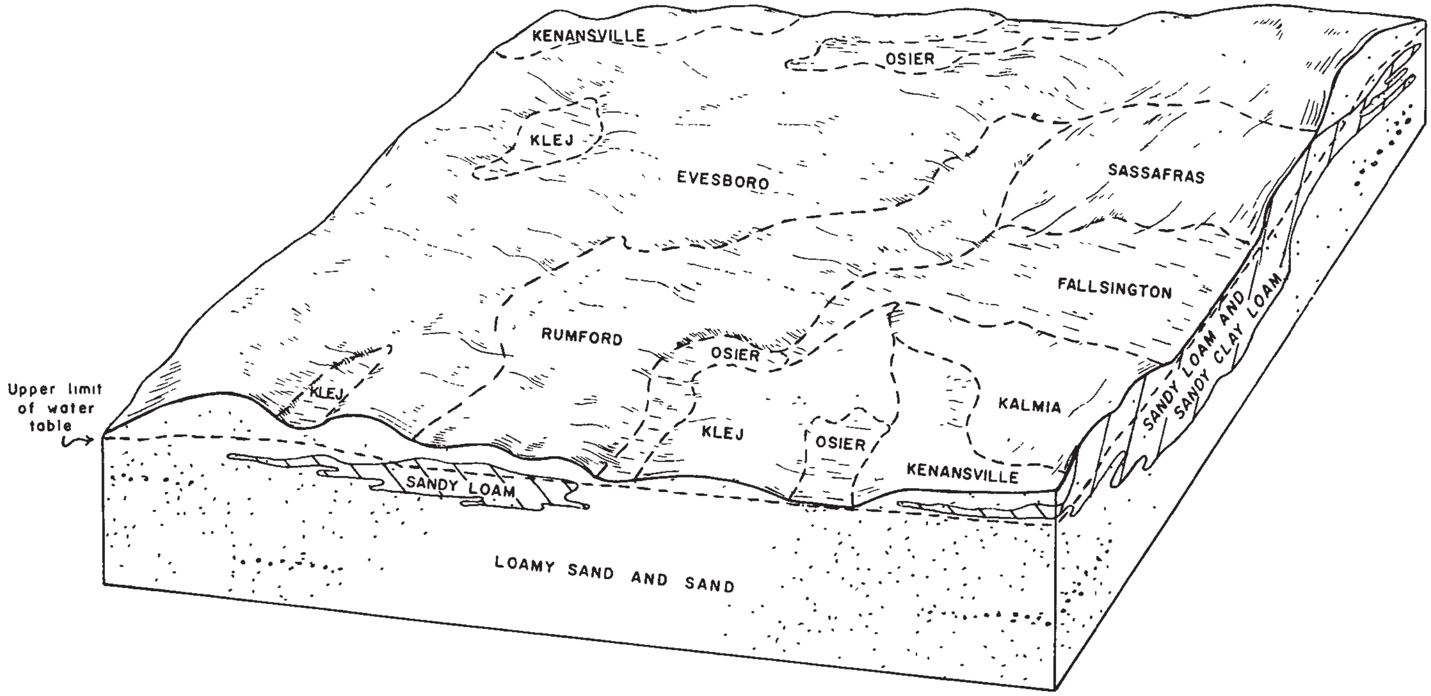

***Figure 5.*—Typical pattern of soils and underlying material in association 4.**

Evesboro and Rumford soils are suited to most crops grown in the county, including corn, soybeans, melons, and various truck or cannery crops. Droughtiness is the main limitation. In areas where high-acre-value crops are grown, supplemental irrigation is commonly available. Erosion generally is not a limitation, but in areas where water is concentrated by a road or other structure there is a hazard of gullying. If the surface soil is unprotected, loose, and dry, blowing sand is a hazard to young tender seedlings.

Most of this association is suited to residential and other nonfarm uses, but there are some limitations that result from the loose, sandy nature of the major soils.

5. *Pocomoke-Fallsington-Evesboro association*

Very poorly drained and poorly drained soils that have a moderately permeable subsoil of sandy loam or sandy clay loam, and excessively drained soils that have a rapidly permeable sandy subsoil

Most of association 5 is in the south-central and southeastern parts of the county. A smaller, detached area occurs between Ellendale and Georgetown.

This association occupies about 12 percent of the total land area of the county. It is about 52 percent Pocomoke soils, 23 percent Fallsington soils, 10 percent Evesboro soils, and 15 percent less extensive soils.

Pocomoke soils are very poorly drained. They have a thick surface layer of black or very dark gray sandy loam and a subsoil of moderately permeable, mottled gray sandy loam. The water table is at or near the surface for long periods during the year.

Fallsington soils have a surface layer of gray to dark grayish-brown sandy loam or loam and a subsoil of gray or light-gray heavy sandy loam or sandy clay loam. They are moderately permeable and poorly drained. The water table is at or near the surface for long periods during the year.

Evesboro soils are droughty. They have a surface layer and subsoil of loamy sand or sand. In the nearly level areas there is a finer textured underlying layer at a depth of 40 to 72 inches. This material tends to hold moisture for deep-rooted crops, and yields are commonly higher in these areas than where the finer textured layer does not occur within 6 feet of the surface.

Less extensive in this association are Berryland, Klej, Osier, and Rutlege soils, all of which are more or less wet, are very sandy, and occupy low positions on the landscape.

All the soils of this association except Evesboro are naturally wet and require artificial drainage before they can be put to full use in farming. Pocomoke and Fallsington soils occupy nearly flat areas that are wet unless artificially drained. Undrained areas are limited chiefly to woodland and wildlife habitat. High yields, particularly of corn and soybeans, can be obtained in drained areas. Blueberries are a locally important crop. Community-owned ditches furnish outlets for drainage systems on individual farms. Generally the drainage systems are adequate, but require good maintenance if they are to be effective.

Corn, soybeans, melons, and various truck or cannery crops are grown on the Evesboro soils. Droughtiness is the main limitation. In areas where high-acre-value crops are grown, supplemental irrigation may be necessary in dry years and is generally available. If the surface soil is unprotected, loose, and dry, blowing sand is a hazard to young tender seedlings.

Only the Evesboro soils of this association are well suited to residential and most other nonfarm uses. They are limited to some extent, however, because the surface

layer and subsoil are loose and sandy. The rest of the soils are severely limited for most nonfarm uses.

6. *Muck-Pocomoke-Swamp association*

Very poorly drained organic soils and soils that have a moderately permeable subsoil of sandy loam, and unclassified soils in fresh-water swamps

Association 6 is in one area in the southern part of the county, just west and northwest of Selbyville. The area was once known as Cypress Swamp, and that name still appears on most maps Most of the cypress was destroyed by a storm in the nineteenth century and was largely replaced by cedars, so on some maps the name appears as Cedar Swamp. Now most of the cedars have been replaced by loblolly pine. The area was burned during the drought years of the early 1930's, and since that time it has been known locally as Burnt Swamp.

This association occupies about 1 percent of the total land area of the county. It is about 50 percent Muck, 20 percent Pocomoke soils, 20 percent Swamp, and 10 percent less extensive soils.

Muck is very poorly drained. It is dark reddish-brown to black organic material that is 15 to 30 inches thick over dominantly gray, sandy to silty or clayey, stratified mineral soil material. In most areas the organic part contains many charcoal fragments that originated when the area was burned. Except in drained areas, the water table is at or above the surface for long periods during the year.

Pocomoke soils also are very poorly drained. They have a thick surface layer of black or very dark gray sandy loam and a subsoil of moderately permeable, mottled gray sandy loam. The water table is at or near the surface for long periods during the year.

Swamp consists of depressions where fresh water stands most, if not all, of the time. The soil material is sand, silt, clay, or organic material, or mixtures of these. It is commonly stratified and has no soil profile development, and it therefore is not classified as a named soil. Most areas of Swamp have a dense vegetative cover of water-tolerant trees.

Less extensive in this association are Berryland, Klej, Osier, and Rutlege soils, all of which are nearly level, more or less wet, and very sandy. Klej soils commonly occupy the highest elevations within the association.

Under intensive artificial drainage, Muck and the Pocomoke soils are suited to farming. Corn and soybeans are the principal crops. Blueberries are grown locally. Muck must be protected from burning if it is sufficiently drained for farming. Swamp is unsuited to farming.

At present, most of the association is about evenly divided between woodland managed for forest products and wildlife habitat. A drainage system has been established for part of the area. Except in cultivated areas, Muck and the Pocomoke soils support good stands of loblolly pine, red maple, and sweetgum. Areas of Swamp have an understory of wetland shrubs, sedges, rushes, and cattails.

7. *Elkton-Matawan-Keyport association*

Poorly drained and moderately well drained soils that have a slowly permeable, clayey subsoil

Association 7 occurs as three small areas in the county. The largest extends from west of Delmar east along the State line and northeastward to the vicinity of Lowes Crossroad. One is at Gravel Hill, and the other is about 2 miles southwest of Milton. The association is characterized in part by the fact that after heavy rain, water ponds and stands much longer than in areas of more permeable soils and crops commonly are lost by drowning.

This association occupies about 1 percent of the total land area of the county. It is about 40 percent Elkton soils, 25 percent Matawan soils, 25 percent Keyport soils, and 10 percent less extensive soils.

Elkton soils are poorly drained. They have a surface layer of dark-gray to grayish-brown loam or sandy loam and a subsoil of slowly permeable clay to heavy sandy clay loam. The water table is at or near the surface for long periods during the year.

Matawan soils are moderately well drained to well drained. They have a thick surface layer of yellowish-brown to pale-brown loamy sand or sandy loam and a subsoil of slowly permeable sandy clay loam to clay loam that is dominantly brown but is mottled with gray in the lower part. The water table is within 2 to 3 feet of the surface during part of the year.

Keyport soils resemble Matawan soils in color, but they have a thinner surface layer of fine sandy loam and a subsoil of slowly permeable clay or silty clay. The water table is within 1½ to 2 feet of the surface during part of the year.

Less extensive in this association are Evesboro, Fallsington, Klej, Sassafras, and Woodstown soils. None of these soils are so slowly permeable as the major soils of the association. Evesboro soils are excessively drained; Fallsington soils are poorly drained.

Improved drainage is needed if the major soils of this association are to be used for farming. This is especially true of the Elkton soils. Tile drains do not function well in the Elkton and Keyport soils, but open ditches and land shaping as necessary generally provide adequate drainage. Tile drains can be used in Matawan soils if the tiles are placed above the slowly permeable subsoil. In some years no artificial drainage is needed for most crops on the sandier Matawan soils. The major soils of this association have moderate to severe limitations for most nonfarm uses.

8. *Fallsington-Sassafras-Woodstown association*

Poorly drained to well-drained soils that have a moderately permeable subsoil of sandy clay loam or sandy loam

Association 8 is in three separate areas in the county. The largest is in the northwestern part of the county. One is in the southwestern part, and the other is about 4 miles east of Bridgeville. The landscape is a broad, nearly level upland that has many depressions and small drainageways. There are few major streams, but the association includes headwaters of some. A large part of the association is naturally wet, and at least half of it is covered with second-growth hardwoods.

This association occupies about 12 percent of the total land area of the county. It is about 32 percent Fallsington soils, 25 percent Sassafras soils, 25 percent Woodstown soils, and 18 percent less extensive soils.

Figure 6 shows a typical pattern of soils and underlying material in this association.

Fallsington soils are poorly drained. They have a surface layer of gray to dark grayish-brown loam or sandy loam and a subsoil of gray or light-gray sandy

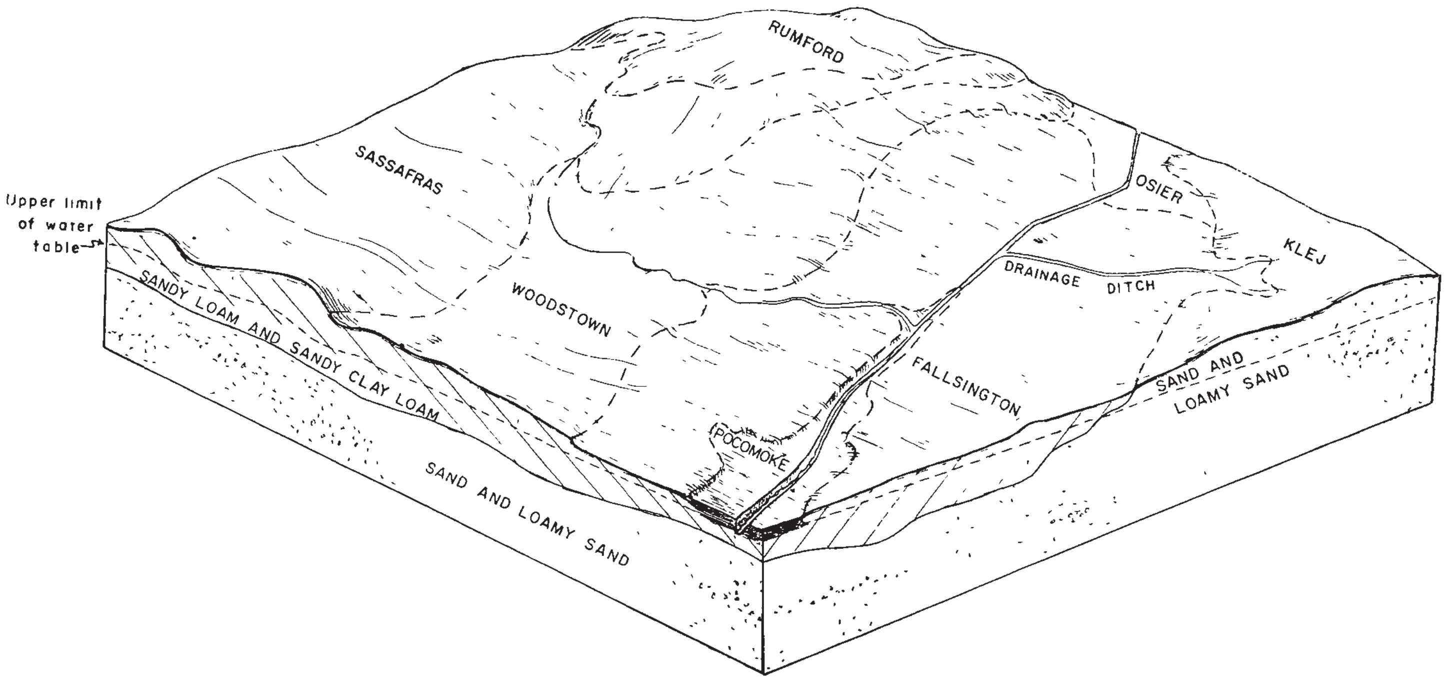

***Figure 6.*—Typical pattern of soils and underlying material in association 8.**

loam or sandy clay loam. The water table is at or near the surface for long periods during the year.

Sassafras soils are well drained. They have a surface layer of grayish-brown sandy loam or loam and a subsoil of strong-brown sandy clay loam or heavy sandy loam. In most areas they are nearly level or gently sloping, but in places slopes are as much as 15 percent.

Woodstown soils are moderately well drained. They have a surface layer of dark grayish-brown to yellowish-brown loam or sandy loam and a subsoil of yellowish-brown sandy clay loam that is mottled with gray in the lower part. The water table is within 1½ to 2 feet of the surface during part of the year.

Less extensive in this association are Klej, Osier, Pocomoke, and Rumford soils. Rumford soils are somewhat excessively drained and occupy low ridges and knolls. The rest are more or less wet and are dominantly sandy.

No more than half of this association has been cleared. Farming is limited mostly to the Sassafras soils and those parts of the Fallsington and Woodstown soils that have been adequately drained. Corn and soybeans are the principal crops. Construction of more community-owned ditches to provide outlets for individual farm drainage systems will make more of this association available for farming. Tile drains function well in most areas if they are properly maintained.

Sassafras soils have few limitations for most nonfarm uses. Nearly all the houses and buildings are on these soils. Woodstown and Fallsington soils have moderate to severe limitations for most nonfarm uses

9. *Fallsington-Pocomoke-Woodstown association*

Very poorly drained to moderately well drained soils that have a moderately permeable subsoil of sandy loam to sandy clay loam

Most of association 9 is in the central part of the county; it extends from the vicinity of Georgetown southward to a point just east of Trap Pond. Another smaller area occurs west and northwest of Ellendale. The landscape is a nearly level headwater flat for natural drainage systems that drain to Chesapeake Bay and the Atlantic Ocean or Delaware Bay. There are many shallow depressions. Drainageways are poorly developed and have few adequate channels. Most of the area is covered with second-growth hardwoods

This association occupies about 12 percent of the total land area of the county. It is about 28 percent Fallsington soils, 25 percent Pocomoke soils, 25 percent Woodstown soils, and 22 percent less extensive soils.

Fallsington soils are poorly drained They have a surface layer of gray to dark grayish-brown loam or sandy loam and a subsoil of gray or light-gray sandy loam or sandy clay loam. The water table is at or near the surface for long periods during the year.

Pocomoke soils are very poorly drained. They have a thick surface layer of black or very dark gray sandy loam and a subsoil of mottled gray sandy loam. The water table is at or near the surface for very long periods during the year

Woodstown soils are moderately well drained. They have a surface layer of dark grayish-brown to yellowish-brown loam or sandy loam and a subsoil of yellowish-brown sandy clay loam that is mottled with gray in the lower part. The water table is within 1½ to 2 feet of the surface during part of the year.

Less extensive in this association are the very sandy, rapidly permeable Evesboro, Klej, Osier, and Rutlege soils and the finer textured, slowly permeable Elkton, Keyport, and Matawan soils.

Improved drainage is needed on all the soils of this association but Evesboro soils if the soils are to be used for farm crops. Farming is limited almost entirely to areas in which drainage has been improved. Corn and soybeans are the principal crops. Construction of more community-owned ditches to provide outlets for individual farm drainage systems will make more of this association available for farming. If properly maintained, tile drains function well in all but the less extensive Elkton and Keyport soils in this association.

Most homes and other buildings in rural areas are on the excessively drained Evesboro soils, which occupy low ridges and knolls. Other soils of the association have moderate to severe limitations for most nonfarm uses because they are wet. Georgetown is the only important townsite within the association. It generally has adequately improved drainage that has been sufficiently well maintained

Descriptions of the Soils

In this section the soils of Sussex County are described in detail. The procedure is to describe first a soil series and then the mapping units in that series To get full information on any one mapping unit, it is necessary to read both the description of that unit and the description of the soil series to which it belongs. The miscellaneous land types are described in alphabetic order along with the soils

The description of each soil series contains a short description of a representative soil profile and a much more detailed description of the same profile that scientists, engineers, and others can use in making highly technical interpretations. The descriptions of the mapping units give the characteristics and qualities of each soil Also included in each description are suggestions for use and management of the soils, somewhat general for the series but more specific, when required, for the mapping unit. At the end of the description of each mapping unit are listed the capability unit and the woodland subclass in which the mapping unit has been placed. The capability classification, the woodland classification, and the page on which each soil and each capability unit is described are given in the Guide to Mapping Units, which is at the back of this publication along with the detailed soil map.

Following the name of each mapping unit, there is a symbol in parentheses This symbol identifies the mapping unit on the detailed soil map The approximate acreage and proportionate extent of each mapping unit are given in table 3.

The color of each soil horizon is described in words and also identified by a symbol called the Munsell color notation, which is used by soil scientists to evaluate the color of the soil precisely. Unless otherwise stated, the colors given in the representative profile are for moist soils; when soils are dry, their colors may be slightly different.

Depth to bedrock is not given in the descriptions of the soils. The soils of Sussex County are underlain by unconsolidated sediments of very great but undetermined thickness; consequently, depth to bedrock does not affect soil use in the county.

Many terms used in the soil descriptions and in other sections of this survey are defined in the Glossary, and more detailed information about the terminology and methods of soil mapping can be obtained from the Soil Survey Manual (*6*).[2]

TABLE 3.—*Approximate acreage and proportionate extent of the soils*

Soil	Area	Extent
	Acres	*Percent*
Berryland loamy sand	2,450	0.4
Borrow pits	1,440	.2
Coastal beach and dune land	5,120	.8
Elkton sandy loam	1,930	.3
Elkton loam	1,630	.3
Evesboro sand, 0 to 5 percent slopes	1,690	.3
Evesboro sand, 5 to 15 percent slopes	1,270	.2
Evesboro loamy sand, 5 to 15 percent slopes	6,570	1.1
Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes	127,580	21.1
Evesboro loamy sand, loamy substratum, 2 to 5 percent slopes	38,160	6.3
Fallsington sandy loam	76,170	12.6
Fallsington loam	6,030	1.0
Fill land	470	.1
Johnston silt loam	13,910	2.3
Kalmia sandy loam	2,990	.5
Kenansville loamy sand, 0 to 2 percent slopes	16,360	2.7
Kenansville loamy sand, 2 to 5 percent slopes	430	.1
Keyport fine sandy loam, 0 to 2 percent slopes	1,850	.3
Keyport fine sandy loam, 2 to 5 percent slopes, eroded	170	(1)
Klej loamy sand	15,700	2.6
Matawan loamy sand	1,270	.2
Matawan sandy loam	680	.1
Muck, shallow	3,890	.6
Osier loamy sand	6,440	1.1
Pocomoke sandy loam	65,030	10.7
Portsmouth loam	470	.1
Rumford loamy sand, 0 to 2 percent slopes	41,450	6.8
Rumford loamy sand, 2 to 5 percent slopes	10,450	1.7
Rumford loamy sand, 5 to 10 percent slopes	880	.1
Rutlege loamy sand	2,240	.4
Sassafras sandy loam, 0 to 2 percent slopes	45,970	7.6
Sassafras sandy loam, 2 to 5 percent slopes	8,320	1.4
Sassafras sandy loam, 5 to 10 percent slopes, eroded	760	.1
Sassafras sandy loam, 10 to 15 percent slopes	330	.1
Sassafras loam, 0 to 2 percent slopes	9,370	1.5
Sassafras loam, 2 to 5 percent slopes	560	.1
Swamp	5,960	1.0
Tidal marsh, fresh	650	.1
Tidal marsh, salty	25,730	4.3
Woodstown sandy loam	50,150	8.3
Woodstown loam	2,920	.5
Total land area	605,440	100.0

[1] Less than 0.05 percent.

Berryland Series

The Berryland series consists of very poorly drained soils that have a hardpan in the subsoil. These soils are on upland flats. They formed in sediments that consist predominantly of sand. The native vegetation is swamp

[2] Italic numbers in parentheses refer to Literature Cited, page 72

maple, holly, gum, loblolly pine, some pond pine, and some water-tolerant oak.

A representative profile in a cultivated area has a 16-inch plow layer of black loamy sand. The subsoil is about 12 inches thick The upper 8 inches is dark-brown loamy sand that is weakly cemented; it is firm when moist but in many places becomes very hard when dry. The lower 4 inches is brown, loose loamy sand. The substratum, from a depth of 28 inches to at least 50 inches, is pale-brown, loose sand.

Berryland soils can be worked whenever they are dry enough to support tillage implements. Their use is very severely limited by very poor natural drainage, a very high water table, very low natural fertility, very low available moisture capacity, and generally extreme acidity. Permeability is moderately rapid.

Representative profile of Berryland loamy sand in a level cultivated area just east of Route 243, about 1½ miles north of Georgetown:

Ap—0 to 11 inches, black (N 2/0) loamy sand, many uncoated white sand grains, very weak, medium, granular structure, very friable, many roots, very strongly acid, clear, smooth boundary.

A1—11 to 16 inches, black (10YR 2/1) loamy sand, weak, thin, platy structure and single grain, friable, common roots and pores, very strongly acid, clear, wavy boundary

B2h—16 to 24 inches, dark-brown (10YR 3/3) loamy sand, massive, firm, weakly cemented, few roots, common pores, dark reddish-brown (2.5YR 2/4) organic material in old root channels, very strongly acid, abrupt, wavy boundary.

B3—24 to 28 inches, brown (10YR 5/3) loamy sand streaked or variegated with grayish colors, single grain, loose; no roots, sand grains coated, very strongly acid, gradual, wavy boundary

C—28 to 50 inches, pale-brown (10YR 6/3) sand streaked or variegated with grayish colors, single grain, loose; extremely acid.

The thickness of the solum ranges from about 28 to 40 inches. Unless limed, this soil is very strongly acid to extremely acid.

The A horizon ranges from about 10 to 16 inches in thickness. In some profiles there is a thin A2 horizon The matrix color has a hue of 10YR or 2 5YR or is neutral. The A1 or Ap horizon has a value of 2 or 3 and a chroma of 0 to 2, and the A2 horizon has a value of 5 to 6 and a chroma of 1 or 2 Where present, the A2 horizon is either sand or loamy sand

The matrix color of the B horizon has a hue of 10YR to 5YR, a value of 2 to 4 (or 5 in the B3), and a chroma of 1 to 3. The B2h horizon is loamy sand or sand. It is dominantly massive and weakly cemented, but in places it is single grain and loose and has coatings on the sand grains

The C horizon is loamy sand or sand. The matrix color has a hue of 10YR or 2.5Y, a value of 4 or 6, and a chroma of 1 to 3

Berryland soils are similar to Johnston, Pocomoke, Portsmouth, and Rutlege soils in color of the surface layer and in natural drainage. They differ from all these soils in having a Bh horizon They formed in the same kind of sediments as the excessively drained Evesboro soils, the moderately well drained to somewhat poorly drained Klej soils, the poorly drained Osier soils, and the very poorly drained Rutlege soils, none of which has a Bh horizon.

Berryland loamy sand (Bd).—Part of the acreage of this nearly level soil is in slight depressions, and part is on very slightly elevated rims It borders Pocomoke and Rutlege soils and Muck, Swamp, and Tidal marsh.

Included with this soil in mapping were small areas where the surface layer is dark gray instead of black and is thinner than that in the profile described. Also included were areas where white sand grains are visible on the black surface.

Only a small acreage is farmed. Corn, soybeans, strawberries, and blueberries are the chief crops. Drainage and fertilization are needed for all of these crops, and lime is needed for all except blueberries. Drainage is easily established if adequate outlets for ditches or tile lines are available. Sprinkler irrigation should be available for crops of high acre-value. Undrained areas are used for woodland and as wildlife habitat. Nonfarm use is severely limited by the water table, which is at or near the surface for long periods during the year. Capability unit IVw–6; woodland subclass 3w.

Borrow Pits

Borrow pits (Bo) are areas from which soil material has been removed, most commonly for use in road or highway construction or for fill material. (See Fill land, page 18.) If the original soils were well drained, the pits are commonly dry. If the original soils had a high water table, the pits are partly filled with water for at least part of the year.

Borrow pits are no longer of any use for farming. Some areas could be revegetated if filled and graded and, in some places, provided with drainage outlets. Even then, they would be suitable chiefly as wildlife habitat or for recreational facilities Some pits in areas where the water table is high could be improved and used for fishing and swimming. Capability unit VIIIs–4; woodland subclass not assigned.

Coastal Beach and Dune Land

Coastal beach and dune land (Co) are areas of noncoherent, loose sand that has been worked and reworked by waves, tides, and wind and is still subject to such action. That part regularly washed by waves and tides commonly is smooth and slopes gently upward away from the water. That part above normal high tide consists of dunes and hummocks that have irregular, mostly short slopes that are constantly changed by wind action (fig. 7).

Most of this land borders the Atlantic Ocean. Smaller areas are adjacent to Delaware Bay, Rehoboth Bay, Indian River Bay, and Little Assawoman Bay. Little if any vegetation grows below the high tide line. Elsewhere there are sparse stands of American beachgrass, beach goldenrod, and switchgrass Shrubs and scattered pines grow on some dunes.

These areas are used intensively for recreation. The dunes are a barrier against storm tides and waves that would affect the marshes and the uplands behind them. The repair of damaged dunes can be speeded by using drift fences (see figure 7) and by planting American beachgrass and fertilizing it to insure optimum growth.

Ramps are needed for foot and vehicular traffic in these areas. Buildings on the dunes are exposed to damage from wind, waves, and flooding. Jetties, bulkheads, and pilings protect buildings during minor storms but not during major tropical storms, or hurricanes. Septic tank drainage fields function well above the water table but are very likely to cause pollution of underground water and nearby open water. Capability unit VIIIs–2; woodland subclass 5t.

Figure 7.—**Typical area of Dune land.**

Elkton Series

The Elkton series consists of poorly drained soils on uplands and in slight depressions (fig. 8). These soils formed in fine-textured marine sediments mantled, in most places, by sediments that contain a considerable amount of sand. The native vegetation is wetland hardwoods and some loblolly pine.

A representative profile in a cultivated area has a 6-inch plow layer of dark grayish-brown sandy loam and a 6-inch subsurface layer of gray sandy loam that is mottled with brownish yellow. The subsoil is about 26 inches thick The upper 14 inches is gray heavy sandy clay loam that is sticky and plastic. The lower 12 inches is gray or light-gray, very sticky and very plastic clay. Both parts are prominently mottled with brownish yellow. The substratum, from a depth of 38 inches to at least 53 inches, is light-gray sandy clay that is very firm, sticky and plastic, and prominently mottled with brownish yellow.

Elkton soils are moderately easy to work if the moisture content is favorable. The water table is seasonally high, and water stands on the surface of undrained depressions for fairly long periods. Open ditches are the best method of drainage; tile drains are impractical because permeability is slow. Wetness and poor natural drainage severely limit many farm and nonfarm uses.

Representative profile of Elkton sandy loam in a level cultivated area on the east side of Route 68, about 2 miles northeast of Delmar:

Ap—0 to 6 inches, dark grayish-brown (10YR 4/2) sandy loam, weak, fine, granular structure; very friable; many roots; many pores, strongly acid; abrupt, smooth boundary.

A2g—6 to 12 inches, gray (10YR 5/1) sandy loam; common, medium, prominent mottles of brownish yellow (10YR 6/8); weak, fine, subangular blocky structure, very friable, many roots, many pores, dark-gray material in root channels and in larger pores; very strongly acid; clear, smooth boundary.

B21tg—12 to 26 inches, gray (10YR 5/1) heavy sandy clay loam; common, medium, prominent mottles of brownish yellow (10YR 6/8); strong, medium, prismatic structure and moderate, medium, blocky, firm, sticky and plastic; many roots between prisms, few pores, continuous clay films of dark gray, prominent on prisms, distinct on blocks; very strongly acid, clear, smooth boundary.

Figure 8.—**Small depression of Elkton sandy loam within an area of Rumford soils, just west of Harbeson. Water stands on the surface because downward movement is slow and no surface outlet is available.**

B22tg—26 to 38 inches, gray or light-gray (10YR 6/1) clay; common, medium, prominent mottles of brownish yellow (10YR 6/8); moderate, medium, prismatic structure, grading toward massive with increasing depth; firm, very sticky and very plastic; common roots between prisms, few pores; gray (10YR 5/1), distinct clay films on prisms; very strongly acid, clear, smooth boundary.

Cg—38 to 53 inches, light-gray (10YR 7/1) sandy clay, common, medium, prominent mottles of brownish yellow (10YR 6/8), massive, very firm, sticky and plastic, very few roots; extremely acid.

The thickness of the solum ranges from about 30 to 40 inches. Some profiles are underlain at a depth of 6 feet or more by much older, organic sediments. Unless limed, this soil is strongly acid to extremely acid.

Matrix colors throughout the profile are 10YR or yellower in hue or are neutral.

The A horizon is either loam or sandy loam. The matrix color has a value of 4 or 5 and a chroma of 1 or 2.

The B horizon is clay or silty clay. In profiles that have a sandy loam A horizon, the upper part of the B horizon in places is heavy sandy clay loam. The average clay content is more than 35 percent The matrix color has a value of 4 to 7 and a chroma of 0 to 2 Mottles range from faint to prominent in hues of 7.5 YR or yellower and in chromas of 4 to 8

The C horizon is sandy clay, sandy clay loam, or sandy loam. The colors have the same range as in the B horizon.

Elkton soils formed in the same kind of sediments as the moderately well drained Keyport soils. They are similar to Fallsington and Osier soils in natural drainage. They contain more clay in the subsoil than either Fallsington or Osier soils.

Elkton sandy loam (El).—This nearly level soil is on upland flats and in depressions. It has the profile described as representative of the series.

Included with this soil in mapping were small areas where the sandy loam surface and subsurface layers are thinner than those in the profile described and other small areas where the sandy clay substratum either is nearer the surface or is lacking. In areas where the substratum is nearer the surface, it is more sandy and less clayey than that in the profile described. Also included were very small areas, mostly of better drained soils, that could not be shown on the soil map and do not appreciably affect use and management.

The soil is used for corn and soybeans. Artificial drainage is needed for good crop growth. The most

practical method of drainage is to grade the land and channel surface water into open ditches. There are many good sites for dug-out or excavated ponds. Most undrained areas, and those in which drainage systems have not been well maintained, support stands of second-growth hardwoods or loblolly pine. Capability unit IIIw-11, woodland subclass 3w.

Elkton loam (Em).—This nearly level soil is in upland depressions, most of them small, but some very large. Except for the texture of the surface layer, this soil has the profile described as representative of the series.

Included with this soil in mapping were small areas where the surface layer is silt loam; and very small areas where the soil is more permeable, or is somewhat better drained, or has a thin, almost black surface layer. None of these characteristics appreciably affect use and management. Also included were some areas near salt water where the lower part of the subsoil and the substratum are considerably more alkaline than is typical of Elkton soils.

Elkton loam is more difficult to work than Elkton sandy loam. It commonly warms up more slowly in spring and is more difficult to drain. A limited acreage is used for corn or soybeans. Artificial drainage is needed for good crop growth. Shaping the land and channeling surface water into open ditches are the most practical methods of drainage. There are many good sites for excavated ponds and some good sites for impounded ponds in upland depressions. Most areas of this soil support stands of second-growth hardwoods or loblolly pine. Capability unit IIIw-9; woodland subclass 3w.

Evesboro Series

The Evesboro series consists of very deep, excessively drained, sandy soils on uplands. The native vegetation is mainly hardwoods and some Virginia pine and loblolly pine.

In a representative profile the surface layer is dark grayish-brown loamy sand about 9 inches thick The subsoil is yellowish-brown to brown, loose loamy sand about 22 inches thick. The substratum, from a depth of 31 inches to 70 inches, is pale-brown, loose sand. Below this is strong-brown sandy loam.

Evesboro soils warm up early in spring, are very easy to work, and can be worked throughout a wide range of moisture content Although the available moisture capacity and natural fertility are low to very low, the level to gently sloping loamy sands are suited to crops. Large amounts of fertilizer are needed. Crops respond to irrigation, and in very dry seasons irrigation is a necessity. Blowing sand sometimes damages young plants. The Evesboro sands and the steeper loamy sands are very poorly suited to crops. Permeability is rapid.

Representative profile of Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes, in a nearly level, cultivated area about one-half mile south of Laurel:

Ap—0 to 9 inches, dark grayish-brown (10YR 4/2) light loamy sand, very weak, fine, granular structure, loose, many roots, many pores, slightly acid if limed, abrupt, smooth boundary.

B—9 to 31 inches, yellowish-brown (10YR 5/4) loamy sand, variegated with brown (10YR 5/3) and yellowish brown (10YR 5/6), single grain; loose, many roots, many pores, slightly acid, clear, smooth boundary.

C1—31 to 70 inches, pale-brown (10YR 6/3) sand, single grain, loose, common roots in upper part, medium acid; abrupt boundary.

IIC2—70 to 76 inches, strong-brown (7.5YR 5/6) sandy loam; massive, friable, strongly acid.

The thickness of the solum ranges from about 24 to 40 inches. Unless limed, this soil is strongly acid to extremely acid

Matrix colors throughout normally are 10YR in hue but range to 7.5YR in parts of the C horizon of some profiles

The A horizon is sand or loamy sand The matrix color has a value of 3 to 5 and a chroma of 2 to 4, the value is lowest in the thin A1 horizon of an undisturbed profile and highest in the A2 horizon of an undisturbed profile

The B horizon is sand or loamy sand. The color value is 5 or 6. The chroma is commonly 4, but varies

The C1 horizon is most commonly sand but in places is loamy sand The IIC2 horizon, at a depth of 40 to 72 inches, is sandy loam or sandy clay loam The matrix color of the C horizon has a value of 4 to 7 and a chroma of 3 to 6, the IIC horizon is mottled or variegated in some profiles

Evesboro soils are the only excessively drained soils in Sussex County They formed in the same kind of sediments as the moderately well drained to somewhat poorly drained Klej soils, the poorly drained Osier soils, and the very poorly drained Berryland and Rutlege soils

Evesboro sand, 0 to 5 percent slopes (EoB).—This soil occupies the slopes of old, dunelike sand ridges in the interior of the county. Its profile is more sandy throughout than the one described as representative of the series. It contains very little fine material and lacks the finer textured layer in the substratum. The sand is noncoherent and very loose, particularly in the lower part of the profile. Wind has reworked the soil material in some places.

Included with this soil in mapping were some very small areas of wetter soils, mostly in small sinks or depressions.

Little of this soil is farmed. Small plots are used for sweetpotatoes, melons, or subsistence gardens. Most of the acreage has a cover of second-growth hardwoods mixed with scattered conifers, commonly Virginia pine. There are many borrow pits and old trash dumps and a few new sanitary land fills. Limitations are slight or moderate for wildlife habitat and for most nonfarm uses. Although trafficability is poor and droughtiness is a problem in landscaping, considerable housing development has taken place in the vicinity of Seaford. Unless lined channels are provided, the concentration of runoff water caused by roads and structures creates a hazard of gullying and washing. Capability unit VIIs-1; woodland subclass 3s.

Evesboro sand, 5 to 15 percent slopes (EoD).—This soil occupies parts of old, dunelike sand ridges in the interior of the county. The sand is loose. Most of it has been reworked by wind, and there are some local sand blowouts.

Included with this soil in mapping were a few acres of short, abrupt slopes that are steeper than 15 percent.

Most of the acreage is wooded with sparse stands of hardwoods and some Virginia pine. There is practically no farming. Small borrow pits and old trash dumps are numerous. The soil is extremely droughty and very low in natural fertility. The most intensive suitable uses for the soil are woodland, wildlife habitat, and some kinds of outdoor recreation. Trafficability is very poor. Capability unit VIIs-1; woodland subclass 3s.

Evesboro loamy sand, 5 to 15 percent slopes (EsD).—This soil has a profile similar to the one described as representative of the series, but it does not have a finer textured substratum within a depth of 6 feet. The soil occupies areas associated with Evesboro loamy sand, loamy substratum, which is nearly level and gently

sloping. Slopes are irregular in places, and some of them have been reworked by wind.

Included with this soil in mapping were a few abrupt, short slopes that are steeper than 15 percent; a few blowouts in areas where loamy material is within a depth of 4 to 6 feet; and some small depressions occupied by somewhat wetter soils.

Most of the acreage is wooded with hardwoods and Virginia pine and some loblolly pine and yellow-poplar. There is practically no farming, except where corners or edges of farm fields extend onto this soil. Some of the older cemeteries in the county are on this soil. Capability unit VIIs–1 woodland subclass 3s.

Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes (EvA).—This soil has the profile described as representative of the series. It is the most extensive soil in the county. It is on broad uplands that are dissected by a few streams.

Included with this soil in mapping were small areas where the substratum contains more clay than that in the profile described; areas where the finer textured material is within a depth of only 30 inches; other small areas where the substratum is sandy to a depth of 6 feet; and other areas of a soil that is paler in color, has some gray or brownish-gray colors below a depth of 30 inches, and is somewhat wet. The wet inclusions are commonly in very small depressions.

This Evesboro soil is somewhat droughty and low in fertility, but less so than Evesboro soils that do not have a loamy substratum. Consequently, it is better suited to most crops and is more productive. Erosion by water is not a hazard. If the surface is loose, dry, and not protected by vegetation, blowing sand (fig. 9) can damage tender crops and create a driving hazard. Soil blowing can be checked by use of adequate windbreaks. Loss of soil by wind, however, is mostly negligible.

Most of the acreage is farmed. The soil is easy to till and is well adapted to large-scale, mechanized farming. Supplemental sprinkler irrigation is generally available. Crops grown respond very well to large applications of fertilizer. Truck crops are especially well suited, including those that can be planted very early. Corn and soybeans are extensively grown.

Good management of this soil includes the use of winter cover crops and all available manure and crop residue. In large open areas young crops can be protected from blowing sand by windbreaks. A good temporary windbreak consists of strips of winter grain, commonly rye, left standing until late in spring.

Wooded areas are dominated by hardwoods. Many formerly cultivated areas support a good stand of loblolly pine. Many communities have been developed on this soil, including parts of Laurel, Milford, Millsboro, Milton, Seaford, and other towns. Capability unit IIIs–1; woodland subclass 2s.

Evesboro loamy sand, loamy substratum, 2 to 5 percent slopes (EvB).—This soil is on slightly elevated ridges or the sides of ridges, commonly within or adjacent to areas of Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes.

Included with this soil in mapping were small areas where the substratum is sandy to a depth of 6 feet and others where the soil is paler, including some gray or brownish-gray colors, below a depth of about 40 inches.

Because the substratum is finer textured, this soil holds more moisture than the other sloping Evesboro soils of the

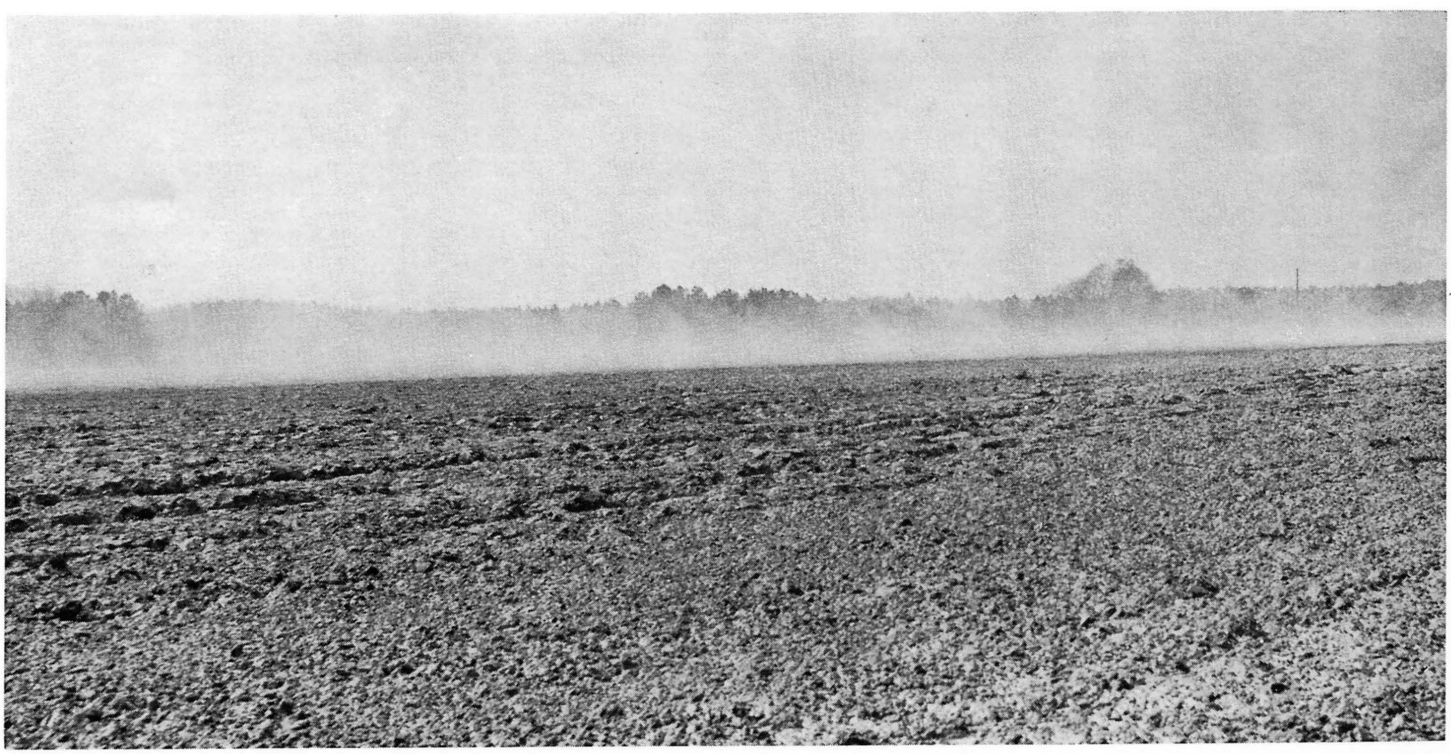

Figure 9.—**Sand blowing across Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes. This broad open area without windbreaks is near Millsboro.**

county and is better suited to crops and more productive. Rainfall ordinarily infiltrates rapidly, so there is little hazard of erosion except after unusually heavy rainfall or where runoff from other areas discharges. Gullying is a hazard where such runoff water concentrates. Blowing sand is a hazard to young crops if the surface is bare.

Much of the acreage is farmed. Corn, soybeans, canning crops, melons, and berries are the chief crops. Supplemental irrigation is generally available for most crops of high acre-value. The soil is easy to till and is commonly one of the first to be planted in spring. Crops respond well to good management.

Good management of this soil includes the use of winter cover crops and all available manure and crop residue. In large open areas young crops can be protected by windbreaks. A good temporary windbreak consists of strips of winter grain, commonly rye, left standing until late in spring. Concentrated runoff should be discharged only into protected channels to prevent formation of gullies and washouts.

Woodland stands consist chiefly of second-growth hardwoods, but loblolly pine dominates in areas that once were cultivated Many communities, including parts of several larger towns, have been developed on this soil Capability unit IIIs-1, woodland subclass 2s.

Fallsington Series

The Fallsington series consists of poorly drained soils on uplands. These soils formed in loamy sediments that contain a considerable amount of sand. The native vegetation is oak, birch, swamp maple, holly, and other wetland hardwoods, and loblolly pine.

A representative profile in a cultivated area has an 8-inch plow layer of dark grayish-brown sandy loam and a 4-inch subsurface layer of gray sandy loam The subsoil is about 21 inches thick The upper 11 inches is mottled gray or light-gray, slightly sticky sandy clay loam The lower 10 inches is mottled light-gray, slightly sticky sandy loam The substratum, from a depth of 33 inches to at least 40 inches, is mottled light-gray, friable sandy loam

Fallsington soils are farmed only in areas where the water table has been lowered by artificial drainage They are not difficult to drain if outlets are adequate. They are easy to work except when they are too wet. The available moisture capacity is moderate to high. Permeability is moderate.

Representative profile of Fallsington sandy loam in a level cultivated area on the east side of Route 68, about 1½ miles east of Delmar.

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) sandy loam, weak, medium, granular structure, very friable, many roots, many pores, medium acid if limed, abrupt, smooth boundary

A2g—8 to 12 inches, gray (10YR 5/1) sandy loam, weak, medium, subangular blocky structure, very friable, many roots, many pores, dark grayish-brown material in old root channels, strongly acid, clear, smooth boundary.

B21tg—12 to 23 inches, gray or light-gray (10YR 6/1) sandy clay loam, a few, medium, prominent mottles of brownish yellow (10YR 6/8), moderate, medium, subangular blocky structure, friable, slightly sticky and slightly plastic, many roots, many pores; thin, discontinuous clay films, strongly acid, clear, smooth boundary.

B22tg—23 to 33 inches, light-gray (10YR 7/1) heavy sandy loam, many, coarse, prominent mottles of brownish yellow (10YR 6/8); very weak, very coarse, blocky structure, very friable, slightly sticky, common roots, many pores, dark-gray (10YR 4/1), thin, discontinuous clay films, very strongly acid, clear, smooth boundary.

Cg—33 to 40 inches, light-gray (10YR 7/1) sandy loam, many, coarse, prominent mottles of brownish yellow (10YR 6/8), massive, friable, few roots, extremely acid.

The thickness of the solum ranges from about 24 to 38 inches. A few, fine, smooth pebbles occur in some profiles, most commonly in the C horizon. Unless limed, this soil is strongly acid to extremely acid

Matrix colors throughout the profile range from 10YR to 5Y in hue or are neutral

The A horizon is either loam or sandy loam The matrix color has a value of 3 to 5 and a chroma of 1 to 3, the value is lowest in the thin A1 horizon of an undisturbed profile.

The B horizon is heavy sandy loam or sandy clay loam and about 18 to 25 percent clay. The matrix color has a value of 4 to 7 and a chroma of 0 to 2 Mottles are commonly yellowish brown or brownish yellow. In some profiles the B horizon is not mottled and has a chroma of 0 or 1

The C horizon is commonly sandy loam that in many profiles grades with increasing depth to loamy sand. It has the same color range as the B horizon.

Fallsington soils are similar to Elkton and Osier soils in color and in natural drainage. They are not so clayey or so slowly permeable in the B horizon as Elkton soils. They are not so rapidly permeable or so sandy as Osier soils. They formed in the same kind of sediments as the well drained Sassafras and Kalmia soils, the moderately well drained Woodstown soils, and the very poorly drained Portsmouth soils.

Fallsington sandy loam (Fa).—This soil has the profile described as representative of the series.

Included with this soil in mapping were areas where material washed from other soils has accumulated. Also included were some areas of this Fallsington soil where the lower part of the subsoil is somewhat finer textured and more sticky than that in the profile described.

This soil is easy to work. It is poorly drained, and in undrained areas it has a water table at or near the surface for long periods. It can be drained by ditches or tile without much difficulty if adequate outlets are available. Natural drainageways are few, however, and long and large drainage mains leading to the nearest streams ordinarily are needed. Land grading is a good way to channel surface drainage into ditches (fig. 10).

Less than half the acreage has been drained and cultivated. Corn and soybeans are the principal crops. Undrained areas support second-growth hardwoods and loblolly pine. Loblolly pine grows more rapidly on this soil than on most other soils of the county. See figure 15, page 40. Limitations are severe for most community uses. Capability unit IIIw-6; woodland subclass 2w.

Fallsington loam (Fs) —This soil has a slightly finer textured subsoil than the soil that has the profile described as representative of the series, and its surface layer, or plow layer, contains more silt and less sand.

This soil holds a larger supply of moisture and plant nutrients than Fallsington sandy loam. It stays wet a little longer in spring and is slightly more difficult to drain. In most areas closer spacing of tile or ditches is needed.

Less than half the acreage has been cultivated. Corn and soybeans are the principal crops Beating rains and the use of heavy equipment when the soil is too moist tend to seal the surface. If sealing occurs, the soil is ponded after heavy rains, even if it has been artificially drained.

Figure 10.—**Well established drainage ditch in area of Fallsington soil.**

Undrained areas are mostly in hardwoods and loblolly pine. Loblolly pine grows more rapidly on this soil than on most others in the county. In undrained areas the water table is at or near the soil surface for long periods during the year. Limitations are severe for most community uses. Capability unit IIIw–7; woodland subclass 2w.

Fill Land

Fill land (Ft) consists of areas that have been filled with 2 feet or more of soil or other geologic material. In some areas the fill is hydraulic material that has been pumped or dredged from bay bottoms or other areas of water. In other places it is soil material transported from areas of Borrow pits and then leveled and graded into low areas.

Fill land is not used for farming. The material is so variable that onsite investigation is needed to determine its suitability and limitations for specific uses. In general, the low fill areas around the bays are exposed to flooding by storm tides, and in consequence are salty, sulfurous, and difficult to reclaim.

Most areas of Fill land, regardless of the source of the fill material, are used for residential, commercial, or recreational purposes. The total area of this land in the the county likely has increased since this survey was made. Capability unit and woodland subclass not assigned.

Johnston Series

The Johnston series consists of very wet, very poorly drained soils on flood plains. These soils formed in recent accumulations that consist of both sediments and a large amount of organic matter. The native vegetation is chiefly swamp maple, gum, holly, pond pine, water-tolerant oaks, and some loblolly pine and cypress.

In a representative profile the surface layer is 29 inches thick. The 7-inch plow layer is very dark brown silt loam that is high in organic-matter content. Beneath this and extending to a depth of about 20 inches is black silt loam that is very high in organic-matter content. This is underlain by a 9-inch layer of dark-brown loam that contains much fibrous organic material. The upper part of the substratum, from a depth of about 29 inches to 40 inches, is dark grayish-brown, sticky silt loam. The lower part of the substratum, to a depth of at least 55 inches, is very dark grayish-brown, loose sand.

Johnston soils are wet for long periods. Artificial drainage is needed for most uses except woodland and wildlife habitat. Drainage is not difficult if outlets are adequate, but not all areas have good outlets. If drained and protected from flooding, these soils are suited to crops and pasture. They are easy to work, but are slow to warm up and have to be planted late. Most areas remain in woodland because clearing is difficult and expensive and the limitations are severe. Permeability is moderately rapid.

Representative profile of Johnston silt loam in a level pasture on the flood plain of Beaverdam Ditch, about 2 miles northeast of Greenwood

Ap—0 to 7 inches, very dark brown (10YR 2/2) silt loam high in content of organic matter, moderate, coarse, granular structure; friable, slightly sticky and slightly plastic, many roots, many pores, very strongly acid, abrupt, smooth boundary

A11—7 to 20 inches, black (10YR 2/1) silt loam very high in content of organic matter, common, medium, distinct mottles of dark reddish brown (2 5YR 2/4) in lower part, weak, coarse, granular structure, friable, slightly sticky and slightly plastic, many roots, many pores, very strongly acid, clear, smooth boundary.

A12—20 to 29 inches, dark-brown (7.5YR 3/2) loam, high in content of fibrous organic matter, massive, firm, few roots, medium acid; clear, smooth boundary.

IIC1g—29 to 40 inches, dark grayish-brown (10YR 4/2) silt loam, variegated with light yellowish brown (10YR 6/4), massive, sticky, no roots, medium acid; clear, smooth boundary.

IIIC2g—40 to 55 inches, very dark grayish-brown (10YR 3/2) sand, single grain, loose, strongly acid.

The thickness of the solum ranges from about 20 to 40 inches but is most commonly not much more than 20 inches. Unless limed, this soil is very strongly acid to extremely acid

Matrix colors throughout the profile are 7.5YR to 5Y in hue or are neutral

The plow layer of the horizon is silt loam, but the rest of the A horizon is silt loam, loam, or fine sandy loam The matrix color is black, very dark gray, very dark grayish brown, or very dark brown, and ranges to dark brown in the lower part.

The C horizon is commonly sand or sand stratified with loamy or clayey material The matrix color is less dark and commonly more grayish than that of the A horizon. In many profiles the C horizon is streaked or mottled.

Johnston soils are similar in drainage and color of the surface layer to the Berryland, Pocomoke, Portsmouth, and Rutlege soils and to Muck, shallow Johnston soils are on flood plains, the only soils on flood plains in the county They have more silt in the A horizon than the other soils named.

Johnston silt loam (Jo).—In many places the surface layer of this soil is black instead of very dark brown.

Included with this soil in mapping in some wooded areas were many places where the uppermost part of the surface layer is mucky and some spots where this muck is several inches thick; some scattered areas, mostly in the general vicinity of Lewes, that have recent surface deposits of silty or sandy material that is not dark colored; and some areas where Johnston silt loam grades gradually into areas of Tidal marsh, fresh; Tidal marsh, salty; or Swamp.

In some areas this Johnston soil is flooded most of the time. Where stream channels have been enlarged and improved, it is only occasionally flooded.

Little of this soil is farmed. Some corn, soybeans, and grazing crops are grown, but most areas support wetland hardwoods and some pond pine and loblolly pine. There are many good sites for impoundments, including most of the older millponds of the county. Plantings that improve wildlife habitat have been established along the enlarged and improved stream channels. Capability unit VIIw-1, woodland subclass 2w

Kalmia Series

The Kalmia series consists of deep, well-drained soils on uplands. These soils formed in loamy sediments that contain a considerable amount of sand. The native vegetation is chiefly mixed hardwoods and some loblolly pine.

A representative profile in a cultivated area has a 9-inch surface layer of brown or dark-brown light sandy loam and a 9-inch subsurface layer of yellowish-brown light sandy loam. The subsoil is yellowish-brown, friable, slightly sticky light sandy clay loam about 12 inches thick. The substratum, from a depth of 30 inches to at least 53 inches, is light-gray, loose loamy sand that is streaked and variegated with reddish yellow.

Kalmia soils are easy to work, and they warm up early in spring. They are well suited to most farm and nonfarm uses. The available moisture capacity is moderate. Permeability is moderate.

Representative profile of Kalmia sandy loam in a level cultivated area on the grounds of the experimental substation of the University of Delaware, about 4½ miles southwest of Georgetown:

Ap—0 to 9 inches, brown or dark-brown (10YR 4/3) light sandy loam; very weak, coarse, subangular blocky structure; very friable; common roots, many pores, strongly acid; abrupt, smooth boundary.

A2—9 to 18 inches, yellowish-brown (10YR 5/6) light sandy loam, weak, medium, subangular blocky structure; very friable, few roots; many pores, strongly acid; abrupt, smooth boundary.

B2t—18 to 30 inches, yellowish-brown (10YR 5/8) light sandy clay loam, weak, medium and coarse, subangular blocky structure, friable, slightly sticky, many pores; thin discontinuous clay films and clay as bridges between sand grains; about 5 percent fine quartz pebbles coated with reddish yellow (7.5YR 6/8), strongly acid; abrupt, smooth boundary.

IIC—30 to 53 inches, light-gray (10YR 7/1) loamy sand prominently streaked and variegated with reddish yellow (7.5YR 6/8), single grain, loose to very friable; very strongly acid

The thickness of the solum ranges from about 30 to 40 inches, but is most commonly within the thinner part of this range Unless limed, this soil is strongly acid to very strongly acid.

Matrix colors throughout the profile are generally 10YR in hue, but in some horizons, most commonly the A2, the hue is 2.5Y.

The A horizon is sandy loam, but it tends to be low in content of silt, and not much finer than loamy sand. The matrix color has a value of 4 or 5 and a chroma of 2 to 6; a chroma of 6 occurs only in the A2 horizon

The B horizon is heavy sandy loam or light sandy clay loam. It has an average clay content of 18 to 24 percent and is less than 20 percent silt The matrix color has a value of 5 or 6 and a chroma of 4 to 8.

Kalmia soils are similar to Kenansville, Rumford, and Sassafras soils They are finer textured in the A and B horizons than Kenansville and Rumford soils, and they have a thinner A horizon than Kenansville soils Kalmia soils are more yellow than Sassafras soils, which have a hue of 7.5YR or 5YR in the B horizon They also contain less silt than Sassafras soils, which are 20 to 35 percent silt in the B horizon Kalmia soils formed in similar kinds of sediments as the well drained Sassafras soils, the moderately well drained Woodstown soils, the poorly drained Fallsington soils, and the very poorly drained Pocomoke soils

Kalmia sandy loam (Ka).—This soil is dominantly level or nearly so; in a few small areas it is gently sloping.

Included with this soil in mapping were a few, very short slopes of 5 to 10 percent; some spots that show some evidence of washing of the surface soil; small spots where the subsoil is heavier and stickier than the one in the profile described; areas where traces of grayish colors are within a depth of 30 inches; and some areas where the surface layer is thicker and somewhat more sandy than that in the profile described.

This is an excellent soil that has practically no limitations for farming. Most of the acreage is intensively used

for truck or canning crops or for field crops and orchards. The few remaining wooded areas support second-growth hardwoods and loblolly pine. Capability unit I–5; woodland subclass 2o.

Kenansville Series

The Kenansville series consists of deep, well-drained soils on uplands. These soils formed in sandy sediments that contain only a small amount of clay and very little silt. The native vegetation is mostly hardwoods, some Virginia pine, and some loblolly pine.

A representative profile in a cultivated area has an 8-inch plow layer of brown loamy sand and an 8-inch subsurface layer of pale-brown loamy sand. This is underlain by a 6-inch transitional layer of yellowish-brown loamy sand. The subsoil is about 8 inches thick and is yellowish-brown, friable sandy loam. The substratum, from a depth of 30 inches to at least 58 inches, is stratified loamy sand, sandy clay loam, and sand that range in color from light gray through pale brown to brownish yellow.

Kenansville soils warm up early in spring and are easy to work. They are suited to some of the earliest maturing crops, especially high-value truck crops. The chief limitations are those caused by sandiness. The available moisture capacity is low to moderate, and natural fertility is low. Large amounts of fertilizer are needed, and in dry seasons irrigation is needed, particularly for high-value crops. Permeability is moderately rapid.

Representative profile of Kenansville loamy sand, 0 to 2 percent slopes, in a nearly level cultivated area just southwest of Laurel:

Ap—0 to 8 inches, brown (10YR 4/3) light loamy sand, weak, coarse, granular structure, loose; many roots; many pores, slightly acid if limed, abrupt, smooth boundary.

A2—8 to 16 inches, pale-brown (10YR 6/3) loamy sand, single grain; loose, many roots; many pores; slightly acid, abrupt, smooth boundary.

A3—16 to 22 inches, yellowish-brown (10YR 5/6) loamy sand, weak, coarse, subangular blocky structure, very friable, common roots and pores, slightly acid, clear, smooth boundary.

B2t—22 to 30 inches, yellowish-brown (10YR 5/8) sandy loam, weak, coarse, subangular blocky structure, friable; few roots; many pores, thin, patchy clay films and clay as bridges between sand grains; medium acid, clear, smooth boundary.

C1—30 to 40 inches, brownish-yellow (10YR 6/8) loamy sand variegated with pale brown (10YR 6/3); single grain, loose; no roots; medium acid; clear, wavy boundary.

C2—40 to 51 inches, light-gray (10YR 7/1) light sandy clay loam; massive; friable, extremely acid; clear, smooth boundary.

C3—51 to 58 inches, light-gray (10YR 7/1) sand, single grain, loose, extremely acid.

The thickness of the solum ranges from about 30 to 40 inches but is commonly within the thinner part of this range Unless limed, this soil is strongly acid to extremely acid

Matrix colors throughout the profile are generally 10YR in hue but range to 2.5Y in the A horizon and to 7.5YR in the B horizon.

The A horizon is characteristically loamy sand more than 20 inches thick The texture is very light and borders on sand in some profiles. The matrix color has a value of 4 to 6 and a chroma of 1 to 8, chroma of 1 and 2 occur only in the A1 or Ap horizon of some profiles.

The B horizon is characteristically no more than 10 inches thick. It is dominantly sandy loam, but in some profiles it contains thin layers as fine as sandy clay loam. The content of clay is 10 to 18 percent (weighted average), and the content of silt is less than 20 percent. The matrix color has a value of 5 or 6 and a chroma of 4 to 8.

The C horizon is loamy sand or sand, but in some profiles it contains strata of sandy loam or light sandy clay loam. The matrix color has a value of 6 or 7 and a chroma of 1 to 8 and is streaked or variegated in some profiles.

Kenansville soils are similar to Kalmia, Rumford, and Sassafras soils. They are yellower in the B horizon than Rumford soils, which have an A horizon less than 20 inches thick. They have a coarser textured B horizon than Kalmia and Sassafras soils, in which the B horizon is more than 18 percent clay. They formed in the same general kind of sediments as the somewhat excessively drained Rumford soils.

Kenansville loamy sand, 0 to 2 percent slopes (KbA).—This soil has the profile described as representative of the series. The thick surface layer of loamy sand absorbs water readily, and there is little runoff and very little hazard of erosion by water.

Included with this soil in mapping were small areas, commonly in slight depressions, that have traces of grayish colors within a depth of 30 inches; and spots where the subsoil is heavier and stickier than the one in the profile described. In some areas this soil is next to Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes, and the boundary between the two soils is difficult to recognize.

Most of the acreage is intensively used. Corn, soybeans, canning crops, and melons are the principal crops. The soil is somewhat droughty, but supplemental sprinkler irrigation is generally available for crops of high acre-value. Blowing sand can damage young tender plants if the surface layer is dry and loose. A good temporary windbreak consists of strips of winter grain, commonly rye, left standing until late in spring.

Wooded areas are dominated by second-growth hardwoods and Virginia pine. Some areas that once were cultivated support stands of loblolly pine. Limitations are few for most nonfarm uses. Capability unit IIs–4; woodland subclass 3o.

Kenansville loamy sand, 2 to 5 percent slopes (KbB).—This soil has a profile similar to the one described as representative of the series, but the sandy loam subsoil is at a greater depth and the surface layer is somewhat irregular and hummocky in many places.

Included with this soil in mapping were small areas, commonly in slight depressions, that have traces of grayish colors within a depth of about 30 inches; and spots where the subsoil is browner than the one in the profile described and a few spots where it is heavier and stickier than that in the profile described. In some areas this soil is next to Evesboro loamy sand, loamy substratum, 2 to 5 percent slopes, and the boundary between the two soils is difficult to recognize.

More than half the acreage is cultivated. Corn, soybeans, canning crops, and melons are the principal crops. The soil retains somewhat less moisture than Kenansville loamy sand, 0 to 2 percent slopes, and during dry periods it requires irrigation at shorter intervals. Large areas of young crops should be protected by windbreaks to prevent damage by blowing sand. A good temporary windbreak consists of strips of winter grain, commonly rye, left standing until late in spring. Concentrated runoff should be discharged into protected channels to prevent gullies and washouts.

Wooded areas consist chiefly of second-growth hardwoods and Virginia pine. Loblolly pine dominates in areas that once were cultivated. Limitations are few for

most nonfarm uses. Capability unit IIs-4; woodland subclass 3o.

Keyport Series

The Keyport series consists of deep, moderately well drained soils on uplands. These soils formed in fine-textured marine sediments that are mantled in places with sandier material. The native vegetation is water-tolerant hardwoods and some loblolly pine.

A representative profile in a wooded area has a 5-inch surface layer of grayish-brown fine sandy loam. This is underlain by a transitional subsoil layer, about 3 inches thick, of pale-brown, sticky silty clay loam. The main part of the subsoil is about 40 inches thick. The upper 10 inches is yellowish-brown, sticky light silty clay that has some brown and red variegations and mottles. The next 17 inches is light yellowish-brown, sticky and plastic silty clay that is mottled with gray and red. The lower 13 inches of the subsoil is gray or light-gray, plastic and very sticky silty clay. The substratum, from 48 inches to a depth of at least 54 inches, is gray or light-gray, very friable loamy fine sand.

Keyport soils are easy to work if they are not plowed too deep. If the plow layer is mixed with too much material from the subsoil, it is sticky when wet and hard and cloddy when dry. Artificial drainage is needed for some crops. Drainage is difficult in places because water moves slowly in the subsoil. The available moisture capacity is high. Permeability is slow.

Representative profile of Keyport fine sandy loam, 0 to 2 percent slopes, in a wooded area on the east side of Route 249, about 3 miles northeast of Georgetown:

A1—0 to 5 inches, grayish-brown (10YR 5/2) fine sandy loam, weak, medium, granular structure, very friable, slightly sticky, many roots, many pores; extremely acid, clear, smooth boundary.

B1—5 to 8 inches, pale-brown (10YR 6/3) silty clay loam, moderate, fine, blocky structure, firm, sticky and slightly plastic; common roots, few pores, traces of clay films; very strongly acid; clear, smooth boundary

B21t—8 to 18 inches, yellowish-brown (10YR 5/4) light silty clay, variegated with brown (10YR 5/3), common, medium, distinct mottles of red (10R 5/6) in lower part, strong, fine and medium, blocky structure, firm, sticky and plastic; common roots, few pores, distinct continuous clay films; very strongly acid; gradual, smooth boundary.

B22t—18 to 35 inches, light yellowish-brown (10YR 6/4) silty clay, many, medium, faint mottles of light brownish gray (10YR 6/2) and common, fine, prominent mottles of red (10R 5/6), strong, medium, prismatic structure and strong, medium and coarse, blocky, very firm, sticky and plastic, few roots; few pores, continuous clay films, thicker on vertical faces than on horizontal faces, very strongly acid, gradual, smooth boundary.

B23tg—35 to 48 inches, gray or light-gray (10YR 6/1) silty clay, strong, coarse, prismatic structure and moderate, thick, platy, very firm, plastic and very sticky, no roots, thick, continuous clay films on vertical faces, very strongly acid, clear, smooth boundary

IICg—48 to 54 inches, gray or light-gray (10YR 6/1) loamy fine sand; single grain; very friable, extremely acid

The thickness of the solum ranges from about 40 to 50 inches. Unless limed, this soil is very strongly acid or extremely acid.

The matrix color throughout the profile is generally 10YR in hue but ranges to slightly redder in the B horizon and slightly yellower in the C horizon

The A horizon is fine sandy loam but grades toward both loam and sandy loam. The matrix color has a value of 3 to 5 and a chroma of 1 to 4, value of 3 and chroma of 1 occur only in a very thin A1 horizon.

The Bt horizon is clay or silty clay. A subhorizon of heavy clay loam or heavy silty clay loam occurs in some profiles. The matrix color has a value of 4 to 6, the chroma is 4 to 6 in the main part of this horizon, but ranges to 3 or less in the lower 10 to 15 inches of some profiles. The upper 10 inches of the Bt horizon has no mottles with chroma of 2 or less, but grayish colors are characteristic of the rest of the Bt horizon, either as mottles or matrix. There are high-chroma mottles, in hues 10YR to 10R, in the Bt horizon of most profiles.

The C horizon matrix color has a value of 4 to 7 and a chroma of 1 to 6 This horizon is mottled or streaked in some profiles

Keyport soils are similar to Klej, Matawan, and Woodstown soils in color and natural drainage, but they have a much more clayey B horizon than those soils. Klej soils have a very sandy B horizon, Matawan soils have a B horizon of clay loam to sandy clay loam, and Woodstown soils have a B horizon of sandy clay loam. Keyport soils formed in the same kind of sediment as the poorly drained Elkton soils.

Keyport fine sandy loam, 0 to 2 percent slopes (KfA).—This soil has the profile described as representative of the series. It occupies upland flats and slight depressions, commonly in association with Elkton soils, which also have a clayey, slowly permeable subsoil.

Included with this soil in mapping were small areas where the surface layer is slightly more sandy, more silty, or thicker than the one in the profile described; and spots, too small to be shown on the soil map, where the subsoil is somewhat sandier and more permeable than that in the profile described.

This soil is only moderately well drained, and the water table rises into the root zone of crops during prolonged wet periods. Crops are likely to be damaged if this condition persists.

Most of the acreage is second-growth woodland. Some corn and soybeans are grown. Artificial drainage is commonly required for cropping, particularly in depressions that have no natural outlet. Open ditches function better than tile drains and are most effective if the soil between the ditches is graded or shaped to channel surface water into the ditches. Plowing to normal depth commonly turns up some subsoil material and makes the plow layer sticky and difficult to work.

Many good pond sites are on this soil. Seasonal wetness and the slow permeability of the subsoil are moderate to severe limitations for most nonfarm purposes. Capability unit IIw-9; woodland subclass 3w.

Keyport fine sandy loam, 2 to 5 percent slopes, eroded (KfB2).—This soil occupies small clay knolls and ridges that rise above the generally level uplands. It has a profile similar to the one described as representative of the series, but in most places most of the original surface layer has been washed away. Because the subsoil is slowly permeable, runoff is more rapid on this soil than on other soils of the county of similar slope. This accelerated runoff washes away part of the surface layer, in all but scattered wooded areas. Plowing commonly turns up material from the yellowish-brown, sticky subsoil. The hazard of further erosion is fairly severe, except in areas where the surface is protected by vegetation.

Included with this soil in mapping were a few spots where slopes are more than 5 percent. In some of these areas the subsoil has been completely exposed through erosion.

This soil has impeded internal drainage and is moderately eroded. It commonly is cultivated only where it occurs in large fields of other soils. In such places, culti-

vating across the small areas of this soil is generally easier than working around them. Erosion is the most important management limitation in tilled areas. Although limitations for most nonfarm uses are moderate to severe, this soil is a relatively more desirable site for buildings than surrounding wet soils. Capability unit IVe–9; woodland subclass 3w.

Klej Series

The Klej series consists of deep, moderately well drained to somewhat poorly drained soils on uplands. The native vegetation consists of mixed oaks, sweetgum, red maple, and loblolly pine.

A representative profile in a cultivated area has a 10-inch surface layer of brown or dark-brown loamy sand. The subsoil, to a depth of about 26 inches, is light yellowish-brown, loose loamy sand that is mottled with grayish colors in the lower part. Below this, to a depth of about 45 inches, the substratum is light brownish-gray, loose loamy sand that is mottled with light brown. The substratum, from a depth of 45 inches to at least 54 inches, is light-gray, friable sandy loam that is prominently mottled with yellowish brown.

Klej soils are very easy to work, but if they are too wet they do not support heavy equipment. The water table fluctuates widely and rapidly with the season. Artificial drainage is needed for early maturing crops and for some deep-rooted, later maturing crops. Drainage is not difficult if outlets are adequate. Natural fertility is low, and large amounts of fertilizer are needed for most crops. Supplemental irrigation is helpful in extended dry seasons. The available moisture capacity is low. Permeability is rapid.

Representative profile of Klej loamy sand in a level area on the east side of Route 350, about 1 mile north of Millville:

Ap—0 to 10 inches, brown or dark-brown (10YR 4/3) loamy sand; weak, coarse, granular structure, very friable, many roots, many pores, strongly acid (limed); abrupt, smooth boundary.

B21—10 to 16 inches, light yellowish-brown (10YR 6/4) loamy sand; single grain, loose; few roots, strongly acid (limed); gradual, wavy boundary

B22—16 to 26 inches, light yellowish-brown (10YR 6/4) loamy sand; common, coarse, faint mottles of light brownish gray (10YR 6/2); single grain; loose, no roots; very strongly acid; clear, smooth boundary.

Clg—26 to 45 inches, light brownish-gray (10YR 6/2) loamy sand, common, coarse, distinct mottles of light brown (7.5YR 6/4); single grain, loose; very strongly acid, abrupt, smooth boundary.

IIC2g—45 to 54 inches, light-gray (2.5Y 7/2) sandy loam, common, medium, prominent mottles of yellowish brown (10YR 5/4), massive; friable, slightly sticky, extremely acid.

The thickness of the solum ranges from about 24 to 40 inches. Unless limed, this soil is very strongly acid to extremely acid

The matrix color throughout the profile is typically 10YR or 2.5Y in hue, it ranges to 5Y in the C horizon of some profiles

The A horizon color has a matrix color value of 3 to 6 and a chroma of 1 to 4, the value and chroma are lowest in the thin A1 horizon of an undisturbed profile.

The B horizon has a matrix color value of 5 or 6 and a chroma of 4 or 6. The lower part of the B horizon is sand, fine sand, or loamy sand. Mottles in the lower part have a chroma of 2 or less.

The upper part of the C horizon is sand or loamy sand, and the IIC2 horizon is sandy loam or finer textured. The matrix color has a value of 5 to 7 and a chroma of 1 to 3. Mottles have a chroma of 4 to 8.

Klej soils are similar to Keyport, Matawan, and Woodstown soils in color and in natural drainage, but are sandier and more rapidly permeable than those soils. They formed in the same kind of sandy sediments as the excessively drained Evesboro soils, the poorly drained Osier soils, and the very poorly drained Berryland and Rutlege soils.

Klej loamy sand (Kl).—This soil is nearly level in most places, and erosion is not a hazard.

Included with this soil in mapping were a few scattered areas where slopes are slightly more than 2 percent; spots where the grayish mottles in the subsoil are at a depth of more than 30 inches; and some spots where the sandy loam substratum is at a depth of more than 5 feet.

This Klej soil is seasonally wet. The water table is within 2 feet of the surface for long periods, during which the soil does not support heavy equipment. Available moisture capacity and the capacity to retain plant nutrients are low. Artificial drainage is needed for most crops that are planted early. Tile drains are more effective than open ditches, which tend to cave.

Corn, soybeans, and some canning crops are grown on this soil. If artificially drained, this soil warms up more quickly and can be worked earlier in the year than other wet or seasonally wet soils of the county. Wheeled vehicles tend to mire in this soil when it is only slightly wet. Heavy equipment should not be used too soon in spring or after heavy rain.

Large areas of this soil support stands of second-growth hardwoods and loblolly pine. Seasonal wetness moderately or severely limits the use of this soil for many nonfarm purposes. Capability unit IIIw–10; woodland subclass 3s.

Matawan Series

The Matawan series consists of deep, moderately well drained to well drained soils on uplands. These soils formed in a mantle of loamy and sandy sediments underlain by older, finer textured marine sediments. The native vegetation is mixed hardwoods and some Virginia pine and loblolly pine.

A representative profile in a wooded area has a 6-inch surface layer of yellowish-brown, loose loamy sand. The subsurface layer, to a depth of about 18 inches, is pale-brown, very friable loamy sand. It is underlain by a transitional layer, about 4 inches thick, of light yellowish-brown, very friable light sandy loam. The subsoil is about 28 inches thick. The upper 10 inches is yellowish-brown sandy clay loam that has a thin layer of fine gravel at its lower boundary. The lower part, to a depth of about 50 inches, is brown, sticky and plastic clay loam that is mottled with gray and red. The substratum, from a depth of 50 inches to at least 60 inches, is brownish-yellow, loose loamy fine sand.

Matawan soils are easy to work. They warm up early enough in spring for most fieldwork. The water table fluctuates, but is within a depth of 2 or 3 feet for only short periods. No artificial drainage is needed for most crops, but drainage is beneficial for very early crops and for certain deep-rooted crops. Supplemental irrigation can be considered during extended dry periods. Permeability is slow in the lower part of the subsoil.

Representative profile of Matawan loamy sand in a level, wooded area just east of Route 249, about 3 miles northeast of Georgetown:

A1—0 to 6 inches, yellowish-brown (10YR 5/4) loamy sand; single grain, loose, many roots and pores, very strongly acid, clear, wavy boundary.

A2—6 to 18 inches, pale-brown (10YR 6/3) loamy sand, variegated with light yellowish brown (2.5Y 6/4); very weak, coarse, subangular blocky structure; very friable, common roots, many pores, strongly acid, clear, smooth boundary

A3—18 to 22 inches, light yellowish-brown (10YR 6/4) light sandy loam, variegated with pale brown (10YR 6/3), weak, coarse, subangular blocky structure; very friable, slightly sticky, few roots; many pores; strongly acid, clear, smooth boundary.

B21t—22 to 32 inches, yellowish-brown (10YR 5/6) sandy clay loam, variegated with light yellowish brown (10YR 6/4); weak, coarse, subangular blocky structure; firm, slightly sticky and slightly plastic, few roots and pores; thin distinct clay films; sand grains clay coated, weathered feldspar evident; fine gravel at lower boundary; very strongly acid; abrupt, smooth boundary.

IIB22t—32 to 50 inches, brown (10YR 5/3) clay loam, distinct mottles of gray or light gray (10YR 6/1), becoming larger and more abundant with increasing depth and dominating the color below a depth of 40 inches; many, medium, prominent mottles of red (10R 5/6), strong, medium, blocky structure grading to strong, coarse, prismatic in lower part, firm, sticky and plastic, continuous clay films, most prominent on vertical faces, very strongly acid, clear, smooth boundary.

IIC—50 to 60 inches, brownish-yellow (10YR 6/6) loamy fine sand, single grain; loose, very strongly acid

The thickness of the solum ranges from about 30 to 50 inches. Unless limed, this soil is strongly acid to extremely acid.

Matrix colors throughout are 10YR or 2.5Y in hue and range to 5Y in the C horizon of some profiles.

The A horizon is characteristically 20 inches or more thick and in places is as much as 32 inches thick It is loamy sand or light sandy loam that is low in content of silt The matrix color has a value of 4 to 6 and a chroma of 2 to 6

The B horizon is generally sandy clay loam in the upper part, but ranges from heavy sandy loam to light clay loam The lower part is clay loam or light sandy clay. The matrix color has a value of 5 or 6 and a chroma of 3 to 6. Mottles in the lower part have a chroma of 1 or 2. High-chroma mottles are 7.5YR or redder in hue. They do not occur in some profiles

The C horizon has a color value of 6 or 7 and a chroma of 1 to 6

Matawan soils are similar to Klej, Keyport, and Woodstown soils in color and in natural drainage They have a thicker A horizon than any of those soils, are less clayey in the B horizon than Keyport soils, and are much less sandy than Klej soils They are less silty than Woodstown soils and are less readily permeable in the lower part of the B horizon than those soils.

Matawan loamy sand (Mm).—This soil has the profile described as representative of the series. It is mostly level or nearly level.

Included with this soil in mapping were small areas where the lower part of the subsoil is finer textured than that in the profile described; areas where the gray mottles in the subsoil are closer to the surface than those in the profile described; and areas where the loamy sand surface layer is as much as 30 inches thick. Also included were scattered, mostly small areas where slopes are slightly more than 2 percent.

This soil is only moderately well drained, but its loamy sand surface layer is so thick and its subsoil so deep that it tends to be droughty in seasons of low or poorly distributed rainfall. In such seasons, supplemental sprinkler irrigation should be available. During periods of heavy rainfall, the loamy sand surface layer quickly becomes saturated and heavy equipment mires easily. If the surface layer is loose and dry, the sand is likely to blow and damage tender plants. A good temporary windbreak consists of strips of winter grain, commonly rye, left standing until late in spring.

Corn, soybeans, and some canning crops are grown on this soil. Wooded areas support stands of second-growth hardwoods and loblolly pine. Limitations are moderate to severe for some nonfarm uses. Capability unit IIs–5; woodland subclass 2o.

Matawan sandy loam (Mn).—This soil has a profile similar to the one described as representative of the series, but the surface layer is less sandy and more coherent and is less than 20 inches thick in most places.

Including with this soil in mapping were small areas where the lower part of the subsoil is either finer textured or coarser textured than that in the profile described, or areas where the gray mottles in the subsoil are closer to the surface, or both. Also included were a few acres where slopes are slightly more than 2 percent.

This soil retains moisture and plant nutrients somewhat better than does Matawan loamy sand, but in some wet or cool years it is not ready for planting as early in spring. It supports heavy equipment better than does Matawan loamy sand, and it is not subject to blowing.

This soil is of minor extent in the county, but most of the acreage is used for corn and soybeans. There are a few small areas of second-growth trees. Limitations are moderate to severe for some nonfarm uses. Capability unit IIw–10; woodland subclass 2o.

Muck

Muck consists of very poorly drained to ponded, extremely acid, organic soils in small to very large upland depressions. These soils formed in well-decomposed plant remains that range from herbs and sedges to hardwoods and cypress. They are underlain by sandy or silty material. The present vegetation is dominated by loblolly pine, but there are many wetland hardwoods and considerable herbaceous undergrowth.

A representative profile has about a 6-inch organic layer of moss, pine needles, and charcoal fragments. The charcoal is the result of burning during a drought period about 1930 and has been identified as mostly of cypress and cedar origin. The next layer, from a depth of about 6 to 14 inches, is dark reddish-brown peaty muck that has common charcoal fragments. From a depth of 14 inches to about 23 inches is black muck of mostly silt-size particles. The upper 7 inches of the substratum is very dark gray loamy sand. It is underlain by a 7-inch layer of grayish-brown silty clay loam. The lower part of the substratum, from a depth of 37 inches to at least 56 inches, is light brownish-gray, loose sand.

In addition to having been burned, most of the muck in Sussex County has been artificially drained or at least partially drained Little of the acreage is used for crops. Most of it supports a good stand of loblolly pine that is managed and harvested for pulpwood. Limitations are severe or very severe for most other uses, except for some kinds of wildlife. Permeability is moderate.

Representative profile of Muck, shallow, in Cedar Swamp, 2 miles south of the intersection of Routes 402 and 403.

Oi1—0 to 3 inches, fibric material, a loose mat of sphagnum moss and undecomposed pine needles.

Oi2—3 to 5 inches, fibric material, a spongy mat of sphagnum moss and decomposed pine needles; common charcoal fragments, bound by fungal hyphae

Oa1—5 to 6 inches, sapric material, charcoal fragments and granules, ⅛ to ½ inch in diameter, bound by fungal hyphae

Oa2—6 to 14 inches, dark reddish-brown (5YR 2/2) sapric material of fibrous appearance, breaking down under pressure to elastic, organic silt; slightly sticky, many roots, common charcoal fragments, extremely acid, clear, wavy boundary.

Oa3—14 to 23 inches, black (10YR 2/1) sapric material of dominantly silt-size particles; weak, very coarse, prismatic structure, cracks between prisms up to half an inch wide when dry, slightly sticky; many roots; many pores, extremely acid, gradual, wavy boundary.

IIC1—23 to 30 inches, very dark gray (10YR 3/1) loamy sand, high in content of organic matter, very weak, very coarse, prismatic structure, slightly sticky, common roots, many pores; extremely acid; abrupt, smooth boundary.

IIIC2—30 to 37 inches, grayish-brown (10YR 5/2) silty clay loam, massive, very sticky, no roots, but common old root channels, extremely acid, abrupt, smooth boundary

IVC3—37 to 56 inches, light brownish-gray (10YR 6/2) sand, single grain, loose, extremely acid

Depth to the unconforming mineral material, or the IIC1 horizon, ranges from about 15 to 30 inches. This soil is uniformly extremely acid but ranges to very strongly acid.

The organic layer, to a depth of about 6 inches, is highly variable in kind of fibric material and content of charcoal fragments.

The Oa2 and Oa3 horizons are muck or peaty muck. The matrix color is 10YR to 5YR in hue or is neutral The value is 2 or 3, the chroma is typically 0 to 2, but ranges to 3 in some profiles.

The C horizon, to a depth of about 60 inches, is commonly stratified but is dominated by sand or loamy sand and has finer textured material in one or more thin strata The matrix color has a hue of 10YR to 2 5Y, a value of 3 to 6, and a chroma of 1 to 3.

There are no other organic soils in Sussex County, but the areas mapped as Muck, shallow, grade into various mineral soils that have a relatively thin A horizon, high in content of organic matter.

Muck, shallow (Mu).—This unit occupies shallow, wet depressions in the landscape. Most of it is within Cedar Swamp, but there are smaller areas elsewhere. Before 1930 some of this land was cultivated and the rest was in swamp maple, sweetgum, some pine and water-tolerant oaks, and considerable cypress. During the drought cycle that began in 1930, Cedar Swamp and some other areas were burned. This burning accounts for the abundance of charcoal fragments described in the representative profile. The new natural vegetation is dominated by loblolly pine in most areas.

Included with this soil in mapping were many small areas where a larger amount of muck was burned and only a few inches of recently deposited organic litter overlies either sand or silty material; and a few low spots where little if any muck was burned and depth to the substratum is 30 inches or more. Also included were small areas of mineral soils, on low knolls or ridges within larger areas of muck, that have a profile similar to that of Berryland, Klej, Pocomoke, Portsmouth, or Rutlege soils.

Little of this soil is used for farming. If artificially drained and otherwise well managed, it would be suitable for such crops as corn, soybeans, and perhaps blueberries. Capability unit IVw-7; woodland subclass 2w.

Osier Series

The Osier series consists of deep, poorly drained, dominantly gray, very sandy soils on flats and in depressions. These soils formed in sandy sediments. The native vegetation is mixed wetland hardwoods and some pond pine and loblolly pine.

A representative profile in a cultivated area (fig. 11) has an 8-inch plow layer of dark grayish-brown loamy sand and a 7-inch subsurface layer of mixed dark grayish-brown and dark-gray loamy sand. The substratum extends from a depth of about 15 inches to at least 60 inches. The upper 11 inches is grayish-brown loamy sand. The next 5 inches is light brownish-gray loamy sand that is mottled with brownish yellow. The lower 29 inches is gray or light-gray, loose, water-bearing sand.

Osier soils can be worked whenever they are dry enough to support tillage implements. Water stands for fairly long periods in depressions that have no outlets. Drainage is relatively easy if outlets are available. Poor natural drainage and a high seasonal water table severely limit the use of these soils for many farm and nonfarm purposes. Permeability is rapid.

Representative profile of Osier loamy sand in a nearly level, cultivated area just east of Route 243, about 1 mile north of Georgetown:

Ap—0 to 8 inches, dark grayish-brown (10YR 4/2) loamy sand; very weak, coarse, granular structure; very friable, many roots, very strongly acid, clear, smooth boundary.

A1—8 to 15 inches, mixed dark grayish-brown (10YR 4/2) and dark-gray (10YR 4/1) loamy sand; very weak, coarse, subangular blocky structure; very friable, common roots; many pores; medium acid; gradual, wavy boundary

C1g—15 to 26 inches, grayish-brown (10YR 5/2) loamy sand, very weak, coarse, subangular blocky structure; very friable; few roots; many pores; medium acid; gradual, wavy boundary.

C2g—26 to 31 inches, light brownish-gray (10YR 6/2) loamy sand; many, medium, prominent mottles of brownish yellow (10YR 6/8); very weak, coarse, subangular blocky structure; very friable, few roots and pores; medium acid; clear, wavy boundary.

C3g—31 to 60 inches, gray or light-gray (10YR 6/1) sand, many, medium, prominent mottles of brownish yellow (10YR 6/8); single grain; loose; very few roots, medium acid, grading to very strongly acid with increasing depth.

The depth to loose sand ranges from about 24 to 40 inches. A few, fine, smooth pebbles occur in the lower parts of some profiles. Unless limed, this soil is very strongly acid or extremely acid.

Matrix colors throughout the profile are 10YR or 2.5Y in hue. The A horizon has a color value of 3 to 5 and a chroma of 1 or 2; a value of 3 occurs only in the thin A1 horizon of an undisturbed profile.

The C horizon has a color value of 4 to 7 and a chroma of 1 or 2. Mottles in the C horizon have a hue of 2.5Y or redder, a value of 5 or 6, and a chroma of 2 to 8 In some profiles the C horizon is not mottled, and the matrix color has a chroma of 1. The C2 horizon is loamy sand or sand, and the C3 horizon is sand or coarse sand.

Osier soils are similar to Elkton and Fallsington soils in color and in natural drainage, but they are much sandier and more rapidly permeable than those soils. They formed in the same kind of sandy sediments as the excessively drained Evesboro

Figure 11.—**Area of Osier loamy sand just north of Georgetown. The representative profile is in this area. Better drained, light-colored Evesboro soil in background.**

soils, the moderately well drained to somewhat poorly drained Klej soils, and the very poorly drained Berryland and Rutlege soils.

Osier loamy sand (Os).—In many places this nearly level soil is in slight depressions.

Included with this soil in mapping were scattered small wooded areas where the surface layer is black or very dark gray; some spots where the soil is even more sandy than the one in the profile described; a few spots where the substratum contains a thin layer of sandy loam or finer textured material; and many spots where the soil is not so poorly drained as the typical Osier soil.

Unless this soil is artificially drained, the water table is seasonally at or near the surface and remains there for very long periods. Artificial drainage is needed for successful farming. Tile drains are the most satisfactory method of drainage. They should be installed when the water table is low to avoid the collapsing of the wet soil into the trenches. Ditches can be dug when the soil is relatively dry, but they rapidly fill with sand as the soil becomes wet during and after heavy rain.

Natural fertility is very low. There is no erosion hazard. About one-third of the acreage is farmed. Corn and soybeans are the principal crops. The rest is chiefly in wetland hardwoods. Limitations are severe for most nonfarm uses. Capability unit IVw–6; woodland subclass 2w.

Pocomoke Series

The Pocomoke series consists of deep, very poorly drained soils on upland flats and in depressions. These soils formed in sandy sediments mantled by loamy material that contains a considerable amount of sand. The native vegetation is wetland hardwoods and some pond pine and loblolly pine. The dominant trees are swamp maple and holly.

A representative profile in a cultivated area has a 10-inch plow layer of black sandy loam that is high in content of organic matter and a 7-inch subsurface layer of dark grayish-brown, friable sandy loam. The subsoil, about 14 inches thick, is gray or dark-gray sandy loam that contains

a little more clay than the surface and subsurface layers. The substratum, from a depth of 31 inches to at least 48 inches, is light-gray loamy sand that is mottled with reddish yellow and contains a few, thin bands of finer textured material.

Pocomoke soils are easy to work, but they stay wet until fairly late in spring. Water stands for fairly long periods in depressions that have no outlets. Drainage is not difficult if outlets are available. Very poor natural drainage and a very high seasonal water table severely limit use of these soils for many farm and nonfarm purposes. Permeability is moderate.

Representative profile of Pocomoke sandy loam in a level cultivated area, about 1 mile west of Hardscrabble:

Ap—0 to 10 inches, black (10YR 2/1) sandy loam; weak, coarse, granular structure, very friable; many roots; many pores; high in content of organic matter, slightly acid if limed; clear, smooth boundary.

A2g—10 to 17 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, fine and medium, subangular blocky structure and medium granular; friable, slightly sticky; many roots; many pores; very strongly acid; clear, wavy boundary.

B2tg—17 to 31 inches, gray (10YR 5/1) sandy loam, grading to dark gray (10YR 4/1) with increasing depth; moderate, coarse, blocky and subangular blocky structure; friable, slightly sticky and slightly plastic; very few roots; many pores; thin clay films, becoming less abundant with increasing depth; extremely acid; clear, wavy boundary.

IICg—31 to 48 inches, light-gray (10YR 7/1) loamy sand; many, coarse, prominent mottles of reddish yellow (7.5YR 6/8); thin horizontal strata of sandy clay loam or sandy clay, coarse-textured part single grain and loose, finer textured part massive and firm, no roots or pores; extremely acid.

The thickness of the solum ranges from about 22 to 40 inches but in most profiles is no more than 30 inches thick. Unless limed, this soil is strongly acid to extremely acid.

The matrix colors throughout the profile range from 10YR to 5Y in hue or are neutral.

The A horizon is sandy loam, but the content of organic matter in the plow layer in many places makes it appear to react as if it were loam. The matrix color has a value of 2 to 6 and a chroma of 2 or less, a value of 2 or 3 is typical only of the A1 or Ap horizon, and a value of 4 or more is typical only of the A2 horizon.

The B horizon is fine sandy loam or sandy loam. In some profiles it contains a very thin layer of sandy clay loam. The matrix color has a value of 4 to 7 and a chroma of 2 or less. This horizon is mottled in some profiles and unmottled in others. Where mottles occur, the color has a hue of 10YR or 7.5YR, a value of 4 to 6, and a chroma of 3 to 8.

The C horizon is commonly loamy sand, but in some profiles it is all or part sand or fine sand. It has the same range in color as the B horizon.

Pocomoke soils are similar to Berryland, Johnston, Portsmouth, and Rutlege soils in color of the surface layer and in natural drainage. They are less sandy above the C horizon than Berryland and Rutlege soils. They contain less clay in the B horizon than Portsmouth soils and much less silt in the A horizon than Johnston soils. They formed in the same kind of sediments as the well-drained Kenansville soils and the somewhat excessively drained Rumford soils.

Pocomoke sandy loam (Pm).—This nearly level soil occupies upland flats and some slight depressions within larger areas of other soils.

Included with this soil in mapping were areas where the surface or plow layer is so high in content of organic matter that it appears to be loam rather than sandy loam. Also included were areas of loam, and small areas where the gray sandy loam subsoil is thinner than the one in the profile described and the loamy sand substratum is nearer the surface.

The water table is seasonally at or near the surface and remains at this level for long periods unless the soil is artificially drained. This soil must be drained for successful farming. It is not difficult to drain if adequate outlets are available. Tile lines or ditches generally are satisfactory.

Less than half the acreage is used for crops. Corn and soybeans are the principal crops, but some truck crops and blueberries are grown. The rest of the acreage is in cutover hardwoods and loblolly pine. Many excellent sites for excavated ponds are on this soil. Limitations are severe for most nonfarm uses. Capability unit IIIw–6; woodland subclass 2w.

Portsmouth Series

The Portsmouth series consists of deep, very poorly drained soils on upland flats and in depressions. These soils formed in loamy sediments that contain a considerable amount of sand. The native vegetation is wetland hardwoods, dominantly swamp maple, gum, and holly, and some pond pine and loblolly pine.

A representative profile in a cultivated area has an 8-inch plow layer of black loam that is high in content of organic matter and a 6-inch subsurface layer of mixed black and dark-gray, friable loam. The subsoil, about 18 inches thick, is gray or light-gray sandy clay loam that is distinctly mottled with brownish yellow. The substratum, from a depth of 32 inches to at least 44 inches, is light-gray, loose loamy sand.

Portsmouth soils are fairly easy to work except when they are too wet or too dry. They stay wet until fairly late in spring. Water stands for long periods in depressions that have no outlets. Drainage is moderately difficult, even if outlets are available. Very poor natural drainage and a very high seasonal water table severely limit these soils for many farm and nonfarm uses. Permeability is moderate.

Representative profile of Portsmouth loam in a level cultivated area on the grounds of the experimental substation of the University of Delaware, about 4½ miles southwest of Georgetown:

Ap—0 to 8 inches, black (10YR 2/1) loam; weak, coarse, granular structure, friable, many roots; high in content of organic matter, strongly acid; abrupt, smooth boundary.

A1—8 to 14 inches, mixed black (10YR 2/1) and dark-gray (10YR 4/1) loam, very dark gray (10YR 3/1) when when rubbed; very weak, coarse, subangular blocky structure, friable, common roots, very strongly acid, abrupt, irregular boundary.

B2tg—14 to 32 inches, gray or light-gray (10YR 6/1) sandy clay loam; common, medium, distinct mottles of brownish yellow (10YR 6/8) in lower part; strong, coarse, prismatic structure, firm, sticky and plastic, common roots between prisms; upper part of prisms coated with very dark gray (10YR 3/1) silty organic material, lower part coated with light-gray (10YR 7/2) clay films; many crayfish holes filled with material from A horizon, very strongly acid; abrupt, irregular boundary.

IICg—32 to 44 inches, light-gray (10YR 7/2) loamy sand; few thin strata or lenses of silty to clayey material; coarse-textured part single grain and loose, finer textured part massive and friable to firm; very strongly acid.

The thickness of the solum ranges from about 25 to 38 inches but is most commonly near 30 inches. Unless limed, this soil is strongly acid to extremely acid. The matrix colors throughout the profile are 10YR to 5Y in hue or are neutral.

The A horizon is loam, but grades to sandy loam in the lower part of some profiles. The matrix color has a value of 2 or 3, or in some profiles 4 below the plow layer, and a chroma of 2 or less.

The B horizon is ordinarily sandy clay loam or clay loam, but is silty clay loam in some profiles. The matrix color has a value of 4 to 6 and a chroma of 2 or less. Mottles have a hue of 10YR or redder and a chroma of 4 to 8 In some profiles the B horizon is not mottled

The C horizon is dominantly sand or loamy sand, but contains thin strata of more silty or more clayey material. The matrix color has a value of 6 or 7 and a chroma of 0 to 4

Portsmouth soils are similar to Berryland, Johnston, Pocomoke, and Rutlege soils in color of the surface layer and in natural drainage. They contain considerably more clay in the B horizon than Pocomoke soils. In contrast with Berryland, Johnston, and Rutlege soils, they have a horizon of clay accumulation, a Bt horizon, and those soils do not. Also they are not so sandy as Berryland and Rutlege soils. Portsmouth soils have a less silty A horizon than Johnston soils, which occur only on flood plains They formed in the same kind of sediments as the well drained Kalmia and Sassafras soils, the moderately well drained Woodstown soils, and the poorly drained Fallsington soils.

Portsmouth loam (Pt).—Most of this nearly level soil occupies slight depressions within larger areas of other soils.

Included with this soil in mapping were a few small areas where the surface layer or plow layer is a little more sandy than the one in the profile described. Also included were some spots where the subsoil contains a little more silt, more clay, or both, than the one in the profile described.

The water table is seasonally at or very near the surface of this soil and remains at that level for very long periods unless the soil is artificially drained. This soil must be drained for successful farming. It is not difficult to drain if adequate outlets are available. Tile lines or ditches generally are satisfactory.

Portsmouth loam contains less sand and more fine material in the surface layer and subsoil than the otherwise very similar Pocomoke sandy loam. It is not quite so easy to drain and to work as that soil, but it retains more moisture during dry periods and more plant nutrients.

About half the acreage is used for crops. Corn and soybeans are the principal crops. The rest of the acreage is in cutover hardwoods and loblolly pine. Many excellent sites for excavated ponds are on this soil. Limitations are severe for most nonfarm uses. Capability unit IIIw-7; woodland subclass 2w.

Rumford Series

The Rumford series consists of deep, somewhat excessively drained soils on uplands. These soils formed in sandy sediments that contain small amounts of clay and very little silt. The native vegetation is mostly hardwoods but includes some loblolly pine and Virginia pine.

A representative profile in a cultivated area has a 9-inch plow layer of dark yellowish-brown loamy sand and a 5-inch subsurface layer of yellowish-brown loamy sand. The subsoil is about 14 inches thick. The upper 4 inches is transitional to the true subsoil and is strong-brown loamy sand variegated with yellowish brown. The rest of the subsoil, from a depth of 18 inches to about 28 inches, is yellowish-red, very friable sandy loam. The substratum is divided into two distinct parts. The upper part, from a depth of 28 inches to about 42 inches, is strong-brown, massive loamy sand. The lower part, from a depth of 42 inches to at least 52 inches, is loose coarse sand that contains much fine gravel. It is commonly a mixture of many colors.

Rumford soils warm up early in spring and are very easy to work. They are suited to some of the earliest maturing crops, especially high-value truck crops. Sandiness is the chief limitation. The available moisture capacity is moderate, and natural fertility is low. Irrigation and applications of large amounts of fertilizer are needed, particularly for high-value crops. Limitations are slight to moderate for most nonfarm uses. Permeability is rapid.

Representative profile of Rumford loamy sand, 0 to 2 percent slopes, in a cultivated area in Primehook Wildlife Refuge at the end of Route 236, about 5 miles northeast of Milton:

Ap—0 to 9 inches, dark yellowish-brown (10YR 4/4) loamy sand; weak, medium, subangular blocky and coarse, granular structure, very friable; many roots; many pores, slightly acid if limed, abrupt, smooth boundary.

A2—9 to 14 inches, yellowish-brown (10YR 5/4) loamy sand; single grain, very friable, many roots, many pores; strongly acid; clear, smooth boundary.

B1—14 to 18 inches, strong-brown (7.5YR 5/6) loamy sand, variegated with yellowish brown (10YR 5/6); weak, medium, subangular blocky structure, very friable; few roots, many pores; strongly acid, abrupt, smooth boundary.

B2t—18 to 28 inches, yellowish-red (5YR 4/6) sandy loam; weak, coarse, subangular blocky structure; very friable, few roots; many pores, thin discontinuous clay films and clay as bridges between sand grains; very strongly acid, clear, smooth boundary.

C1—28 to 42 inches, strong-brown (7.5YR 5/6) loamy sand, massive; very friable; few roots, many pores; very strongly acid, abrupt, smooth boundary.

IIC2—42 to 52 inches, finely variegated gravelly coarse sand, single grain, loose, no roots, very strongly acid.

The thickness of the solum ranges from about 28 to 40 inches but is most commonly in the thinner part of this range. A few, fine, smooth pebbles occur throughout some profiles, most commonly in the C horizon. Unless limed, this soil is strongly acid or very strongly acid.

The A horizon matrix color has a hue of 10YR or 2.5Y, a value of 4 to 6, and a chroma of 2 to 4.

The B horizon is commonly sandy loam but is loamy sand in the upper few inches of some profiles. In some profiles it contains thin layers or subhorizons of light sandy clay loam. The matrix color has a hue of 7.5YR or 5YR, a value of 4 or 5, and a chroma of 4 to 8.

The C horizon is commonly stratified with loamy sand to sand or coarse sand. The matrix color has a hue of 7.5YR or yellower, a value of 5 to 8, and a chroma of 2 to 6. In most profiles the color is variegated in at least part of the C horizon.

Rumford soils are similar to Kalmia, Kenansville, and Sassafras soils. They are redder in the B horizon than Kalmia and Kenansville soils, have a thinner A horizon than Kenansville soils, and are coarser textured throughout the solum than Kalmia and Sassafras soils They formed in the same kind of sediments as the well-drained Kenansville soils and the very poorly drained Pocomoke soils.

Rumford loamy sand, 0 to 2 percent slopes (RuA).—This soil has the profile described as representative of the series. It is nearly level and occupies broad uplands and some slight depressions.

Included with this soil in mapping were small areas where the subsoil is somewhat more or less sandy than the one in the profile described; and in some slight depressions, small areas of a soil that is seasonally somewhat wet and has grayish colors within a depth of about 30 inches.

This soil is somewhat droughty and is low in natural fertility. Supplemental sprinkler irrigation is commonly

available for high-acre-value crops (fig. 12). Soil blowing is a slight hazard and damages young plants during some seasons. Windbreaks are locally desirable. There is little runoff and very little hazard of erosion.

More than half the acreage is cultivated. Corn, soybeans, truck crops, and melons are the principal crops. Some pastures have good carrying capacity.

Good management of this soil for crops includes the use of winter cover crops and of all available manure and crop residue. Wooded areas support second-growth hardwoods, some Virginia pine, and locally, some loblolly pine. Limitations are few for most nonfarm uses. Capability unit IIs–4; woodland subclass 3o.

Rumford loamy sand, 2 to 5 percent slopes (RuB).—This soil commonly occupies areas between the more level soils on upland flats and the major drainageways. It has a profile similar to the one described as representative of the series, but the surface layer is somewhat more sandy, the subsoil is at a slightly greater depth, and the soil tends to be somewhat more droughty.

Included with this soil in mapping were small areas where the subsoil is somewhat more or less sandy than that in the profile described; and in slight depressions and swales, very small areas of a soil that is somewhat wet and has some grayish colors within a depth of about 30 inches.

During dry periods, lack of moisture affects crops 1 to 3 days earlier than in areas of Rumford loamy sand, 0 to 2 percent slopes. The availability of supplemental sprinkler irrigation is especially important for high-acre-value crops. Soil blowing is a slight hazard and damages young plants during some seasons. Windbreaks are locally desirable. There is commonly little runoff and little hazard of erosion.

More than half the acreage is cultivated. Corn, soybeans, truck crops, and melons are the principal crops. Good management includes the use of winter cover crops and all available manure and crop residue. Wooded areas support second-growth hardwoods, some Virginia pine, and locally, some loblolly pine. Limitations are few for most nonfarm uses. Capability unit IIs–4; woodland subclass 3o.

Rumford loamy sand, 5 to 10 percent slopes (RuC).—This soil occurs as narrow strips adjacent to drainageways and also as slightly elevated knolls. It has a profile similar to the one described as representative of the series, but the surface layer is somewhat more sandy, the soil is at a slightly greater depth, and the soil tends to be more droughty.

Included with this soil in mapping were small areas where the subsoil is very thin, or very thick, or both.

This soil is susceptible to erosion and is somewhat droughty. Gullies and washouts tend to develop where water collects along field roads or other structures and is then discharged across areas of this soil. Such areas can be protected by permanent vegetation or by lined channels.

Little of the acreage is cultivated. Appropriate measures are needed for control of erosion in cultivated areas. Most areas are in second-growth hardwoods, Virginia pine, or both. Limitations are few for nonfarm uses. Capability unit IIIe–33; woodland subclass 3o.

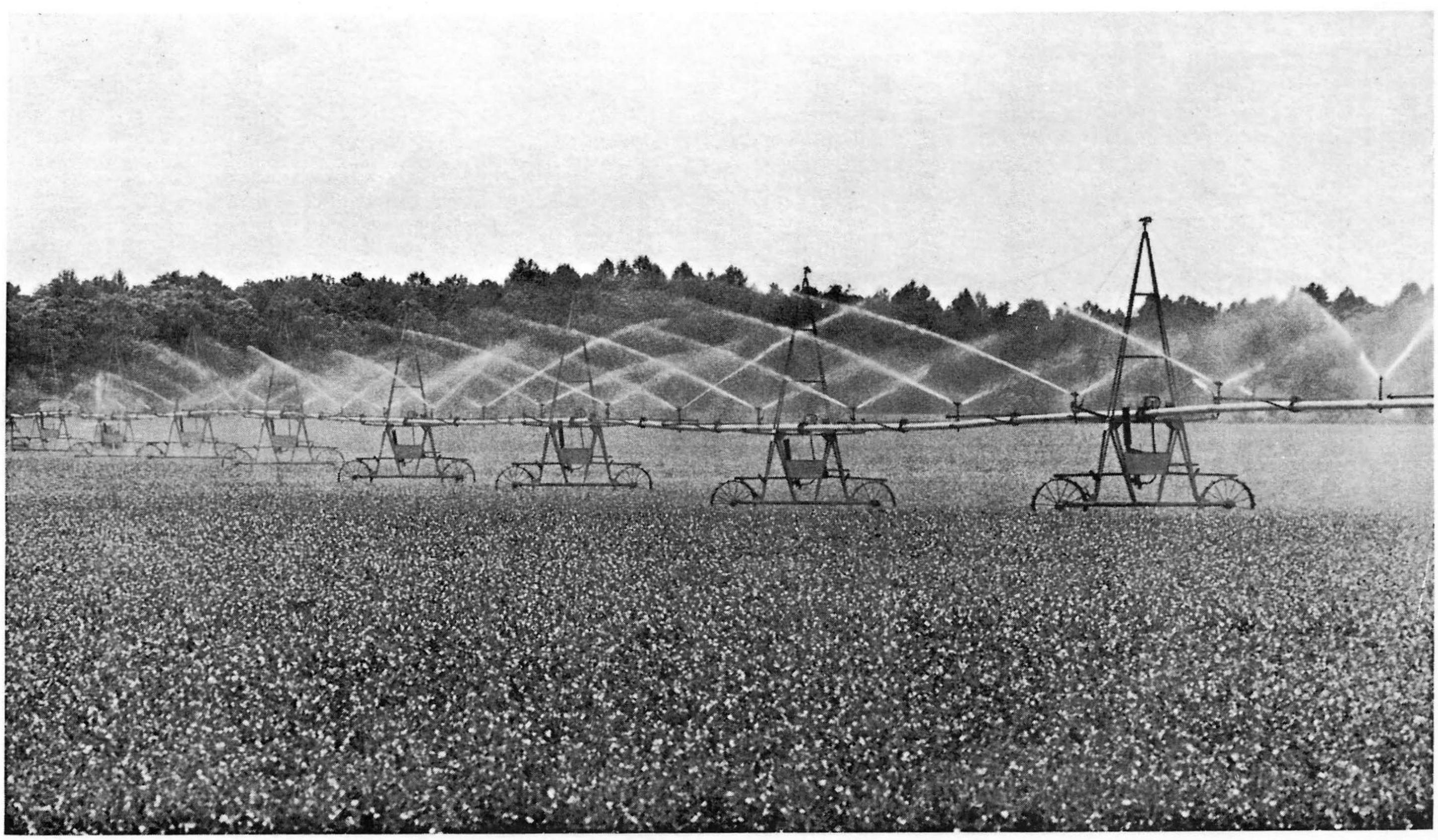

Figure 12.—**Sprinkler irrigation of English peas on Rumford loamy sand, 0 to 2 percent slopes, near Milton.**

Rutlege Series

The Rutlege series consists of deep, very poorly drained soils on upland flats and in depressions. These soils formed in sandy sediments. The native vegetation is wetland hardwoods, dominantly swamp maple and holly and some pond pine and loblolly pine.

A representative profile in a cultivated area has a 9-inch plow layer of black, loose loamy sand that is high in content of organic matter and an 8-inch subsurface layer of dark-brown to very dark brown loamy sand. The substratum, from a depth of 17 inches to at least 60 inches, is light-gray, loose loamy sand that grades to sand with increasing depth.

Rutlege soils can be worked whenever they are dry enough to support tillage implements. Water stands for long periods in depressions that have no outlets, but drainage is relatively easy where outlets are available. Very poor natural drainage and a high seasonal water table severely limit the use of these soils for many farm and nonfarm purposes. Permeability is rapid.

Representative profile of Rutlege loamy sand in a level cultivated area on the grounds of the experimental substation of the University of Delaware, about 4½ miles southwest of Georgetown:

Ap—0 to 9 inches, black (10YR 2/1) loamy sand, single grain; loose; many roots; medium acid if limed, abrupt, smooth boundary.

A1—9 to 17 inches, very dark brown (10YR 2/2) loamy sand, grading to dark brown with increasing depth; single grain; loose; common roots; strongly acid; abrupt, smooth boundary.

Cg—17 to 60 inches, light-gray (10YR 7/1) loamy sand, grading to sand with increasing depth; single grain; loose; a few roots in upper part; very strongly acid

The thickness of the solum ranges from about 10 to more than 20 inches. Unless limed, this soil is very strongly acid or extremely acid.

Matrix colors throughout the profile are 10YR to 5Y in hue or are neutral.

The A horizon is loamy sand, but it appears to be finer textured because it has a high content of organic matter. The matrix color has a value of 2 or 3 and a chroma of 0 to 2.

The C horizon is sand or loamy sand that grades to sand with increasing depth. The matrix color has a value of 4 to 7. In some profiles the C horizon is mottled. Where it is mottled, the matrix chroma is 0, 1, or 2, where it is not mottled, the matrix chroma is 0 or 1. Mottles have a hue of 7.5YR or yellower, a value of 5 to 8, and a chroma of 1 to 6. In some profiles the C horizon is variegated or streaked.

Rutlege soils are similar to Berryland, Johnston, Pocomoke, and Portsmouth soils in color of the surface layer and in natural drainage. They are sandier throughout than Johnston, Pocomoke, and Portsmouth soils. They do not have the hardpan Bh horizon that is characteristic of Berryland soils. They formed in the same kind of very sandy sediments as the very poorly drained Berryland soils, the excessively drained Evesboro soils, the moderately well drained to somewhat poorly drained Klej soils, and the poorly drained Osier soils.

Rutlege loamy sand (Ry).—This soil is level or nearly so and in places occupies slight depressions within larger areas of other soils.

Included with this soil in mapping were a few very small areas where the surface layer is dark gray or very dark gray instead of black and spots where the sand in the surface layer is finer textured than that in the profile described.

The water table is seasonally at or near the surface and remains at this level for very long periods unless the soil is artificially drained. The soil must be drained for successful farming. Tile drains are the most satisfactory method of drainage. They should be placed when the water table is low to prevent the wet soil from collapsing into the trenches. Ditches can be dug when the soil is relatively dry, but they rapidly fill with sand when the soil becomes wet during and after heavy rain.

Most of the acreage is in wetland trees, but some corn and soybeans are grown. Very poor natural drainage, strong to extreme acidity, and sandiness are severe limitations for most nonfarm uses. There is no erosion hazard. Capability unit IVw-6; woodland subclass 2w.

Sassafras Series

The Sassafras series consists of deep, well-drained soils on uplands. These soils formed in loamy and sandy sediments. The loamy material contains a considerable amount of sand. The native vegetation is mixed hardwoods and some loblolly pine.

A representative profile in a cultivated area has a 7-inch plow layer of dark grayish-brown, very friable sandy loam and a 7-inch subsurface layer of brown sandy loam. The subsoil is about 17 inches thick. The upper 5 inches is yellowish-brown, friable sandy loam. The rest is strong-brown, friable but slightly sticky sandy clay loam. The substratum, from a depth of 31 inches to at least 50 inches, is yellowish-brown, loose loamy sand.

Sassafras soils warm up early in spring, and they are easy to work. They are well suited to most farm and nonfarm uses, but some areas are limited by slope and the hazard of erosion. Available moisture capacity is high. Permeability is moderate.

Representative profile of Sassafras sandy loam, 0 to 2 percent slopes, in a cultivated area on the grounds of the experimental substation of the University of Delaware, about 4½ miles southwest of Georgetown:

Ap—0 to 7 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, fine, granular structure; very friable; many roots, many pores; medium acid if limed; abrupt, smooth boundary.

A2—7 to 14 inches, brown (10YR 5/3) sandy loam; weak, fine, granular structure; very friable; few roots; many pores, medium acid, clear, wavy boundary.

B1—14 to 19 inches, yellowish-brown (10YR5/4) sandy loam; weak, medium, subangular blocky structure; friable, slightly sticky; few roots, common pores; strongly acid, clear, wavy boundary.

B2t—19 to 31 inches, strong-brown (7.5YR 5/6) sandy clay loam, moderate, medium, subangular blocky structure; friable, slightly sticky and slightly plastic, very few roots; common pores; almost continuous clay films, strongly acid, clear, smooth boundary.

C—31 to 50 inches, yellowish-brown (10YR 5/6) loamy sand, single grain; loose, no roots; extremely acid.

The thickness of the solum ranges from about 30 to 40 inches. A few, fine, smooth pebbles occur throughout some profiles and are abundant in the lower part of the C horizon in a few profiles. Unless limed, this soil is strongly acid to extremely acid.

The A horizon is sandy loam or loam. The matrix color is generally 10YR in hue. It has a value of 3 to 5 and a chroma of 1 to 4; a value of 3 and a chroma of 1 are typical only of a thin A1 horizon in an undisturbed profile.

The B horizon is commonly sandy clay loam but ranges to loam or heavy sandy loam. The matrix color has a hue of 7.5YR or 5YR, but a hue of 10YR occurs in the upper few inches, or the B1 horizon, in some profiles. It commonly has a value of 5, but is 6 in some profiles; the chroma ranges from 4 to 8 but is most commonly 6.

The C horizon is most commonly loamy sand, but the upper part is sandy loam in many profiles. The matrix color is commonly 10YR or 7.5YR in hue. It has a value of 5 to 7 and a chroma of 4 to 8. In most profiles, both value and chroma are higher in the C horizon than in the B horizon.

Sassafras soils are similar to Kalmia, Kenansville, and Rumford soils. They are finer textured in the solum than Kenansville and Rumford soils and have a thinner A horizon than Kenansville soils. They are redder in hue in the B horizon than Kalmia soils and contain more silt in the solum than those soils. They formed in the same kind of sediments as the well drained Kalmia soils, the moderately well drained Woodstown soils, the poorly drained Fallsington soils, and the very poorly drained Portsmouth soils.

Sassafras sandy loam, 0 to 2 percent slopes (SaA).—This soil has the profile described as representative of the series.

Included with this soil in mapping were a few spots that show some evidence of washing of the surface soil. In some parts of the county, especially in areas just northwest of Lewes, deep plowing in the past turned up some material from the subsoil, and these areas have a browner surface color than is typical for the series.

Limitations are few for farm or nonfarm uses. This soil is well drained, retains moisture and plant nutrients moderately well, and is easy to work. If properly managed, it can be used intensively for cultivated crops with little risk of deterioration. The hazard of erosion is slight. Capability unit I–5; woodland subclass 3o.

Sassafras sandy loam, 2 to 5 percent slopes (SaB).—This soil has a profile similar to the one described as representative of the series, but in some areas erosion has removed a few inches of the original surface layer. In some parts of the county, deep plowing in the past turned up some material from the subsoil, and these areas have a browner surface layer than is typical for the series. Most slopes are smooth and less than 300 feet long.

Most of the acreage is farmed (fig. 13). Canning crops, corn, soybeans, orchards, and nursery stock are the principal crops.

Erosion is a moderate hazard in clean-tilled areas. The cropping system should provide for the brief periods when the soil is not protected by vegetation. Good management also includes the use of winter cover crops and retention of crop residue on or near the surface. Farming on the contour is especially effective if combined with other conservation measures. Waterways for the disposal of excess surface water can be sodded or otherwise protected. Limitations are few for most nonfarm uses. Capability unit IIe–5; woodland subclass 3o.

Sassafras sandy loam, 5 to 10 percent slopes, eroded (SaC2).—In most areas erosion has removed several inches of the original surface layer from this soil. There are some shallow gullies and some hummocky areas and small depressions. The hazard of erosion, by washing, is severe.

Included with this soil in mapping are small, severely eroded spots and some small areas where the surface layer is more silty and less sandy than the one in the profile described.

Most of the acreage is used for canning crops, corn, soybeans, orchards, and nursery stock. Except in woodland, the hazard of erosion is severe. Contour farming is especially effective in retarding or controlling erosion,

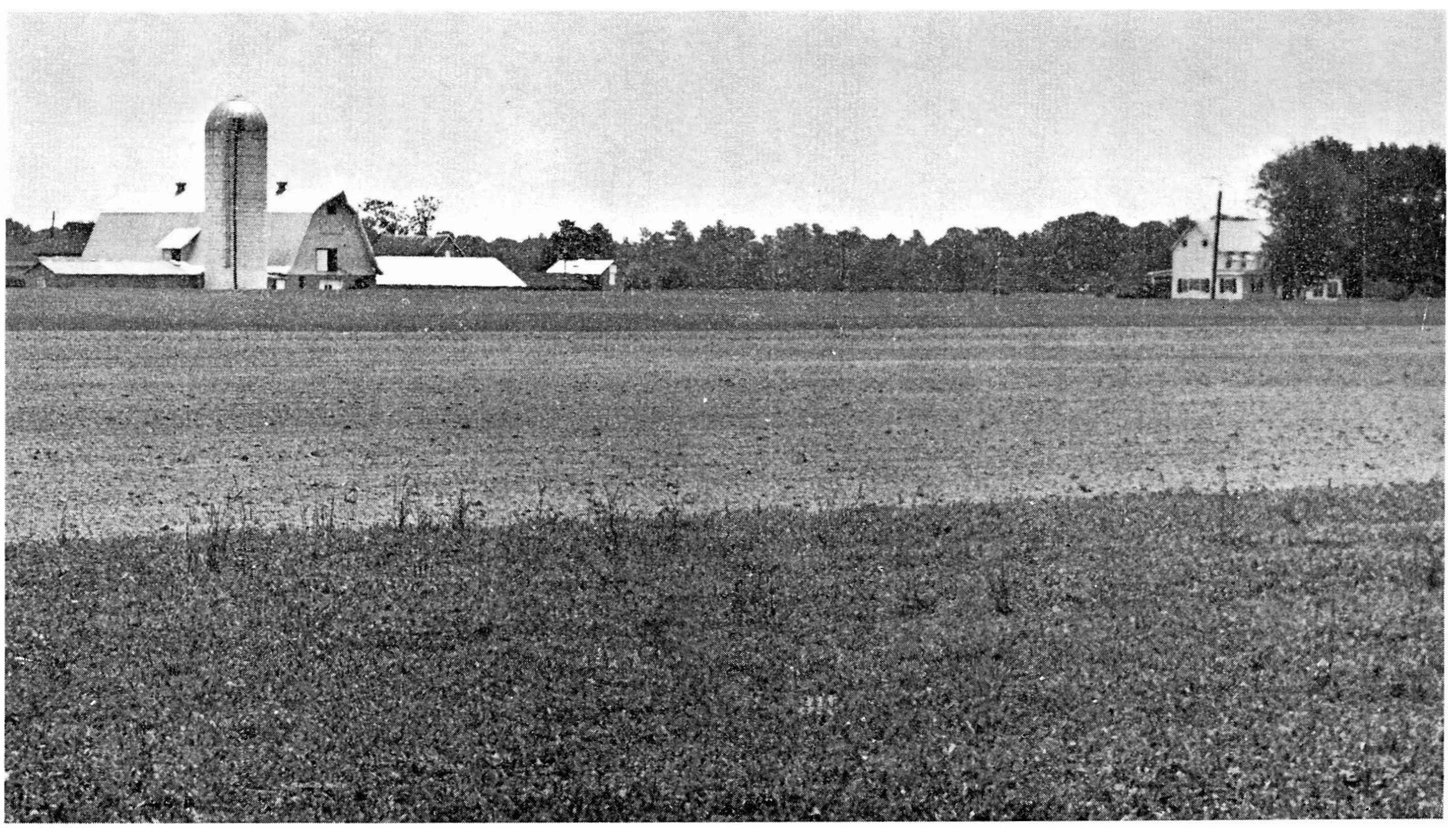

Figure 13.—**Typical farmstead on Sassafras sandy loam, 2 to 5 percent slopes, near Milton.**

and it is most effective where clean-tilled and close-growing crops are in alternate strips. The cropping system should provide for only very brief periods and when the soil is not protected by vegetation. Good management also includes the use of winter cover crops and the retention of crop residue on or near the surface. Waterways for the disposal of excess surface water can be sodded or otherwise protected. Slope is the limiting factor, and the limitation is no more than moderate for most nonfarm uses of this soil. Capability unit IIIe-5; woodland subclass 3o.

Sassafras sandy loam, 10 to 15 percent slopes (SaD).—Most areas of this soil are under protective woodland cover. Scattered spots in cleared or formerly cleared areas are moderately to severely eroded.

Included with this soil in mapping were small areas where the surface layer contains a little more silt and less sand than the one in the profile described; and a few acres where slopes are slightly more than 15 percent.

The erosion hazard is so severe in cleared areas that this soil is critical or only marginal for cultivated crops. Any cropping should be done on the contour, in alternate strips wherever the landscape permits. Runoffs can be channeled through sodded or otherwise protected waterways.

This soil is better suited to permanent hay or pasture, sodded orchards, or trees and other plants for wood crop products, and wildlife than to other uses. Slope is the limiting factor for most nonfarm uses of this soil. The limitation ranges from moderate to severe. Capability unit IVe-5; woodland subclass 3o.

Sassafras loam, 0 to 2 percent slopes (SfA).—The surface layer of this soil is more silty, generally a little more clayey, and less sandy than the surface layer of Sassafras sandy loam, and the subsoil is commonly a little more clayey.

Included with this soil in mapping were a few spots where a small part of the surface layer has been washed away.

This soil holds a larger supply of moisture and of plant nutrients than Sassafras sandy loam and is slightly better suited to most crops, especially during drier periods. The hazard of erosion is slight, and the soil has few if any limitations for farm or nonfarm uses.

By most standards, this is the best soil for farming in the county. Nearly all the acreage is farmed. Canning crops, corn, and soybeans are the principal crops. There are also some commercial orchards and nurseries. A few small areas support stands of second-growth hardwoods and some Virginia or loblolly pine. Capability unit I-4; woodland subclass 3o.

Sassafras loam, 2 to 5 percent slopes (SfB).—In some areas erosion has removed a few inches of the original surface layer from this soil. The hazard of erosion is moderate unless the surface is well protected. Most slopes are smooth and fairly long, but in places they are short and mostly irregular.

Most of the acreage is farmed. Canning crops, corn, soybeans, orchards, and nurseries are the principal uses. The cropping system should provide a protective cover of vegetation so that the surface is unprotected for only brief periods. Good management also includes the use of winter cover crops and the retention of crop residue on or near the surface. Farming on the contour is especially effective if combined with other conservation measures. Waterways for disposal of excess surface water can be sodded or otherwise protected. Limitations are few for most nonfarm uses. Capability unit IIe-4; woodland subclass 3o.

Swamp

Swamp (Sw) consists of areas where fresh water stands most or all of the time. Some areas are along the lower courses of streams, just upstream from Tidal marsh. Others occupy depressions in broad flats at higher elevations, where natural drainageways have not formed. The native vegetation is mainly dense stands of water-tolerant vegetation, including swamp maple or red maple, gum, holly, sweet bay, and some pond pine and cypress. The soil material is sand, silt, clay, muck, or mixtures of these and is commonly stratified.

Swamp cannot be used for any crops commonly grown in the county, unless expensive clearing, drainage, and reclamation measures are taken. These measures are not economically feasible for new farm land. Such reclamation also would destroy some valuable timber as well as distinctive and valuable wildlife habitat. Although there are some valuable timber trees, planting and management of trees generally are not economically feasible. Swamp provides some food and much cover for various kinds of wildlife. In exceptionally dry seasons, it provides some browse for livestock. Capability unit VIIw-1; woodland subclass not assigned.

Tidal Marsh

Tidal marsh is extensive in low coastal areas and along tidal reaches of streams and their estuaries. Most of these marshes in Sussex County are salty or strongly brackish. Smaller areas near the upper tidal limits of streams are fresh or only slightly brackish.

Soil materials vary greatly, depending largely on degree of salinity, elevation in relation to mean high tide, distance from open water, and depth to underlying material, which is most commonly sandy. Native vegetation also varies, depending chiefly on salinity and on elevation in relation to mean high tide.

A representative profile in an undisturbed salty area has a 5-inch surface layer of very dark grayish-brown clay loam that is very low in density, sticky and plastic, and matted with fibrous roots, and high in organic matter content This layer is underlain by bluish-gray silty clay loam, about 13 inches thick, that is low in density, plastic and very sticky, and moderate in organic-matter content. From a depth of 18 inches to about 93 inches is dark-gray, sticky and slightly plastic loam that is very low in density and high in organic-matter content.

Tidal marsh is usually saturated with water. When it dries, the volume of soil shrinks by 30 to 40 percent and reaction in all but the surface layer changes from neutral to strongly acid or extremely acid. The change in reaction is mainly the result of oxidation of sulfur compounds.

Tidal marsh is not used for farming. It provides food and cover for wildlife and hunting of migratory waterfowl.

Representative profile of Tidal marsh, salty, in a level, undisturbed area 350 feet east of Oyster Rocks Road and 475 feet south of the Broadkill River, in Great Marsh:

A1—0 to 5 inches, very dark grayish-brown (10YR 3/2) clay loam; no apparent structure, sticky and plastic; matted, fibrous roots; roots and plant remains estimated at more than 50 percent of wet volume; organic-matter content 13 percent by weight; N-factor less than 0.5, shrinkage about 36 percent from wet to dry condition, mildly alkaline when wet, slightly acid when dry; clear, smooth boundary.

C1g—5 to 18 inches, bluish-gray (5B 5/1) silty clay loam; massive; plastic and very sticky, many fibrous roots; roots and plant remains estimated at about 20 percent of wet volume; organic-matter content 3.2 percent by weight; N-factor greater than 0.5; shrinkage about 28 percent from wet to dry condition, neutral to mildly alkaline when wet, extremely acid when dry; sulfurous odor, abrupt, smooth boundary.

C2g—18 to 93 inches, dark-gray (10YR 4/1) loam; massive; sticky and slightly plastic, many roots in upper part; roots and plant remains estimated at nearly 50 percent of wet volume; organic-matter content 10.5 percent by weight; N-factor greater than 0 5; shrinkage about 40 percent from wet to dry condition, neutral to mildly alkaline when wet, strongly acid to very strongly acid when dry.

Tidal marsh, fresh (Tf).—This marsh is affected by fresh to only slightly brackish tidal action, and tidal fluctuation is less than that in most salty areas. It differs from Tidal marsh, salty, mainly in content of salt and sulfur. The sulfur content is low enough that there is no great change in reaction when the material dries. The material is strongly acid to extremely acid whether wet or dry.

Vegetation is mainly American three-square, arrow-arum, cattail, pickerelweed, rice cutgrass, sedges, smartweed, spatterdock, spikerush, wild millet, and wild rice. There are gradations in vegetation between Tidal marsh, fresh, and Tidal marsh, salty.

Tidal marsh, fresh, furnishes excellent food and cover for raccoons and muskrats, as well as for rails, nesting ducks, and migratory ducks. It is less attractive to migratory geese than Tidal marsh, salty. Capability unit VIIIw-1; woodland subclass not assigned.

Tidal marsh, salty (Tm).—This marsh has the profile described as representative of Tidal marsh, salty. The most obvious variation in the profile is the depth to underlying material, which in most places is sandy. The depth ranges from 2 or 3 feet in some hummocks and near the boundaries with upland soils, to an undetermined depth in the interior of broad marshes. In many areas where tidal fluctuations are great, the strata, or horizons, are almost completely liquid, and the surface level of the marsh rises and falls with the tide.

Vegetation in the wetter areas is mostly marsh-hay, cordgrass, needlerush, Olney's three-square, saltgrass, and saltmarsh bulrush. On knolls or other areas just above the high-tide line, the vegetation is bigleaf swampweed, groundsel bush, high-tide bush, smooth cordgrass, and switchgrass. Gradations occur between these types of vegetation.

Tidal marsh, salty, is used mostly for food and cover for waterfowl, both migratory and nonmigratory. It is also used for hunting. Capability unit VIIIw-1; woodland subclass not assigned.

Woodstown Series

The Woodstown series consists of deep, moderately well drained soils on uplands. These soils formed in loamy sediments that contain a considerable amount of sand. The native vegetation is water-tolerant hardwoods, dominantly oaks, and considerable amounts of loblolly pine in places.

A representative profile in a cultivated area has a 10-inch plow layer of dark grayish-brown sandy loam and a 4-inch subsurface layer of yellowish-brown sandy loam. The subsoil is about 24 inches thick. The upper 9 inches is yellowish-brown, friable, slightly sticky sandy clay loam. The lower 15 inches is yellowish-brown sandy clay loam that is prominently mottled with gray or light gray. The substratum, from a depth of 38 inches to at least 48 inches, is gray or light-gray, very friable sandy loam.

Woodstown soils are easy to work, but they tend to be wet in spring and to warm up later than better drained soils. Artificial drainage is needed, or is at least beneficial, for early maturing crops and for certain deep-rooted crops. The soil is not difficult to drain if adequate outlets are available. Tile is effective. The available moisture capacity is high. These soils are moderately or severely limited for some uses by seasonal wetness and a moderately high water table. Permeability is moderate.

Representative profile of Woodstown sandy loam in a nearly level, cultivated area just north of Hardscrabble, about 8 miles southwest of Georgetown:

Ap—0 to 10 inches, dark grayish-brown (10YR 4/2) sandy loam; weak, coarse, granular structure; friable; many roots; many pores; neutral if limed; abrupt, smooth boundary.

A2—10 to 14 inches, yellowish-brown (10YR 5/4, variegated with 10YR 5/6) sandy loam; weak, medium, subangular blocky structure, friable; many roots; many pores; slightly acid; abrupt, smooth boundary.

B21t—14 to 23 inches, yellowish-brown (10YR 5/4, variegated with 10YR 5/6) sandy clay loam, weak, medium, subangular blocky structure; friable, slightly sticky, many roots, many pores, thin discontinuous clay films, strongly acid, gradual, smooth boundary.

B22t—23 to 38 inches, yellowish-brown (10YR 5/6) sandy clay loam, many, coarse, prominent mottles of gray or light gray (10YR 6/1), massive in part, very weak, coarse, subangular blocky structure in part, friable, slightly sticky, few roots, many pores; sand grains coated with clay as bridges between grains; very strongly acid; gradual, smooth boundary.

Cg—38 to 48 inches, gray or light-gray (10YR 6/1) sandy loam; massive, very friable, no roots, very strongly acid.

The thickness of the solum ranges from about 24 to 40 inches. Unless limed, this soil is strongly acid to extremely acid

Matrix colors throughout the profile are 10YR or 2.5Y in hue and range to 5Y in the lower part of the B horizon and in the C horizon of some profiles

The A horizon is sandy loam or loam. The matrix color has a value of 4 to 6 and a chroma of 1 to 4, value and chroma are highest in the A2 horizon.

The B horizon is ordinarily sandy clay loam or loam, but ranges to heavy sandy loam in the subhorizons of some profiles. The matrix color has a value of 5 or 6 and a chroma of 4 to 8. Mottles in the lower part of the B horizon have a chroma of 1 or 2 Some profiles contain high-chroma mottles.

The C horizon is sandy loam or loamy sand. The matrix color is of a lower chroma and generally a higher value than that in the B horizon.

Woodstown soils are similar to Keyport, Klej, and Matawan soils in color and natural drainage. They have a less clayey and more rapidly permeable B horizon than Keyport soils. They are less sandy than Klej soils and not so rapidly permeable as those soils. They have a thinner A horizon and generally a thinner solum than Matawan soils, contain more silt, and are more readily permeable in the B horizon than those soils. They

formed in the same general kind of sediments as the well-drained Kalmia and Sassafras soils, the poorly drained Fallsington soils, and the very poorly drained Portsmouth soils.

Woodstown sandy loam (Wo).—This soil has the profile described as representative of the series. It is generally nearly level, and the hazard of erosion is slight.

Included with this soil in mapping were small areas where slopes are slightly more than 2 percent.

The water table is seasonally within a depth of 1½ to 2 feet and remains at that level for fairly long periods unless the soil is artificially drained. Even where the soil is drained, water may stand on the surface for at least a short period after heavy rain (fig. 14). The soil is not difficult to drain where adequate outlets are available. Either tile lines or ditches are generally satisfactory.

Artificial drainage is desirable but not generally necessary for corn or soybeans. It is necessary for crops of high acre-value. Intermittent wetness can disrupt planting, tilling, and harvesting schedules. Idle areas have a cover of second-growth, wet-tolerant hardwoods and some loblolly pine. Limitations are moderate to severe for most nonfarm uses. Capability unit IIw-5; woodland subclass 2o.

Woodstown loam (Ws).—This soil has a finer textured surface layer that contains more silt and less sand than the soil that has the profile described as representative of the series. It is nearly level in most areas.

Included with this soil in mapping were small areas where slopes are slightly more than 2 percent.

This soil holds a somewhat larger supply of moisture and plant nutrients than Woodstown sandy loam, but it is generally not so easy to work and drain because it is less sandy. It is commonly not ready for planting quite so early in spring as the sandier soil.

The water table is seasonally within a depth of 1½ to 2 feet and remains at this level for fairly long periods unless the soil is artificially drained. Even where the soil is drained, water may stand on the surface for at least moderate periods after heavy rain. Either tile lines or

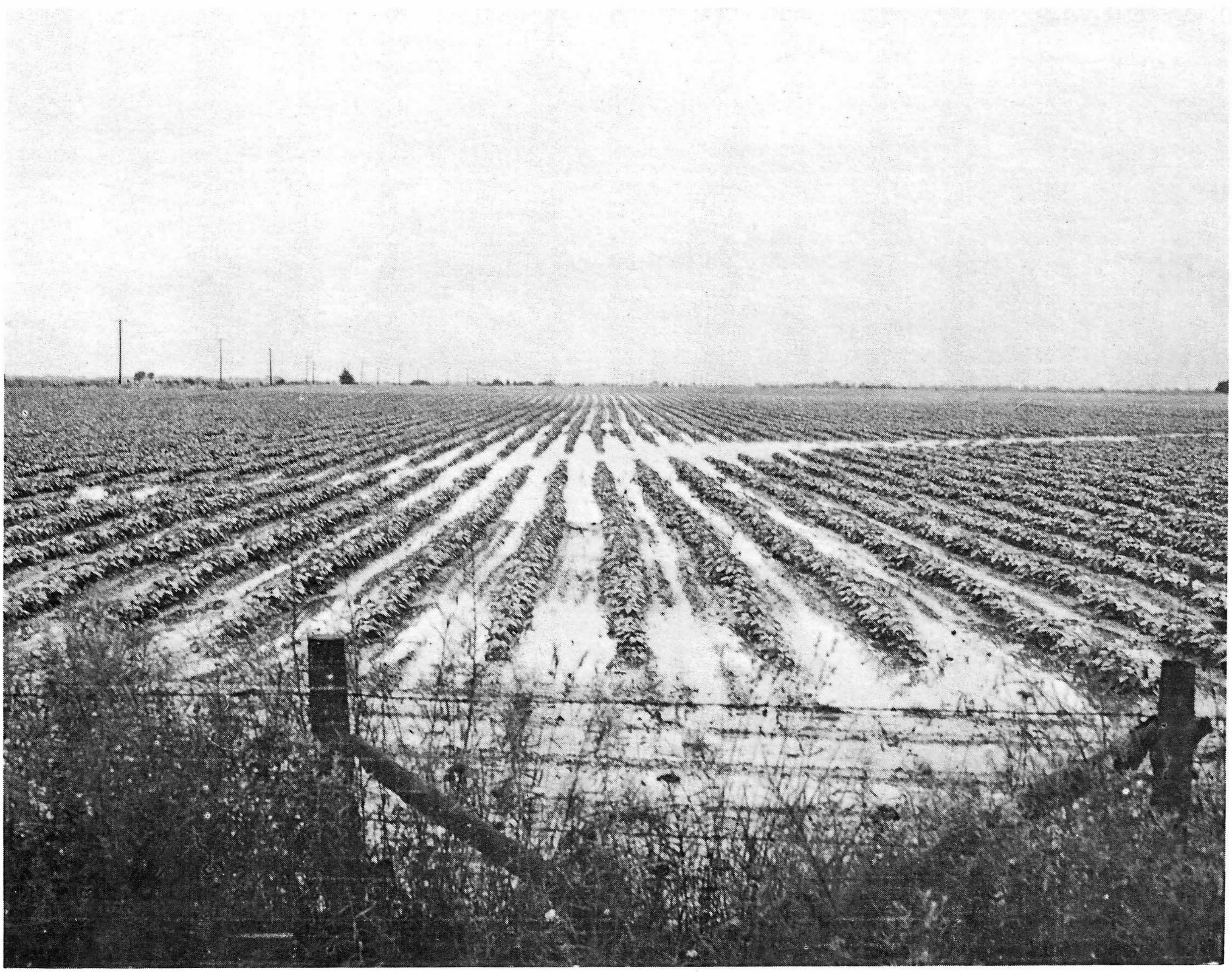

Figure 14.—Water on Woodstown sandy loam. Broadkill Neck, northeast of Milton.

ditches can be used for drainage, but outlets must be adequate.

Artificial drainage benefits corn or soybeans, but may not be needed. It is needed for crops of high acre-value or for other intensive use; otherwise, intermittent wetness disrupts planting, tilling, and harvesting schedules, which might be disastrous for certain crops. Idle areas have a cover of second-growth, wet-tolerant hardwoods and some loblolly pine. Limitations are moderate to severe for most nonfarm uses. Capability unit IIw-1; woodland subclass 2o.

Use and Management of the Soils

This section contains information about the use and management of the soils of Sussex County as cropland, woodland, wildlife habitat, and engineering material. It also describes soil properties that are significant in town and country planning.

Capability Grouping

Capability grouping shows, in a general way, the suitability of soils for most field crops. The soils are grouped according to their limitations when used for field crops, the risk of damage when they are so used, and the way they respond to treatment. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils; does not take into consideration possible but unlikely major reclamation projects; and does not apply to rice, cranberries, horticultural crops, or other crops that require special management.

Those familiar with the capability classification can infer from it much about the behavior of soils when used for other purposes, but this classification is not a substitute for interpretations designed to show suitability and limitations of soils for woodland, for wildlife habitat, for engineering, or for other nonfarm uses.

In the capability system, the soils are grouped at three levels: the capability class, the subclass, and the unit.

CAPABILITY CLASSES, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use.

CAPABILITY SUBCLASSES are soil groups within one class; they are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is too cold or too dry.

In class I there are no subclasses, because the soils of this class have few limitations. Class V can contain, at the most, only the subclasses indicated by *w*, *s*, and *c*, because the soils in class V are subject to little or no erosion, although they have other limitations that restrict their use largely to pasture or range, woodland, wildlife, or recreation.

CAPABILITY UNITS are soil groups within the subclasses. The soils in one capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity and other responses to management. Thus, the capability unit is a convenient grouping for making many statements about management of soils. Capability units are generally designed by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-5. Thus, in one symbol, the Roman numeral designates the capability class, or degree of limitation; the small letter indicates the subclass, or kind of limitation, as defined in the foregoing paragraph; and the Arabic numeral specifically identifies the capability unit within each subclass.

The eight classes in the capability system and the subclasses and units in Sussex County are described in the list that follows. The units are not numbered consecutively within the subclasses, because they fit into a Statewide system of capability classification and not all the capability units in the State are represented in this county.

Class I: Soils have few limitations that restrict their use (no subclasses).

- Capability unit I-4. Deep, well-drained, moderately permeable, nearly level soils that have a loam surface layer and a high available moisture capacity.
- Capability unit I-5. Deep, well-drained, moderately permeable, nearly level soils that have a sandy loam surface layer and a moderate to high available moisture capacity.

Class II: Soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Subclass IIe: Soils subject to moderate erosion unless protected.

- Capability unit IIe-4. Deep, well-drained, moderately permeable, gently sloping soils that have a loam surface layer and a high available moisture capacity.
- Capability unit IIe-5. Deep, well-drained, moderately permeable, gently sloping soils that have a sandy loam surface layer and a high available moisture capacity.

Subclass IIw: Soils moderately limited because of excess water.

- Capability unit IIw-1. Moderately well drained, moderately permeable, nearly level soils that have a loam surface layer and a high available moisture capacity.
- Capability unit IIw-5. Moderately well drained, moderately permeable, nearly level soils that have a sandy loam surface layer and a high available moisture capacity.
- Capability unit IIw-9. Moderately well drained, slowly permeable, nearly level soils that have a fine sandy loam surface layer and a high available moisture capacity.
- Capability unit IIw-10. Moderately well drained, slowly permeable, nearly level soils that have a thick sandy loam surface layer and a high available moisture capacity.

Subclass IIs: Soils moderately limited by droughtiness.

Capability unit IIs–4. Deep, well-drained to somewhat excessively drained, moderately rapidly permeable to rapidly permeable, nearly level and gently sloping soils that have a loamy sand surface layer and a low to moderate available moisture capacity.

Capability unit IIs–5 Deep, moderately well drained to well drained, slowly permeable, nearly level soils that have a thick loamy sand surface layer and a moderate available moisture capacity.

Class III· Soils have severe limitations that reduce the choice of plants, require special conservation practices, or both.

Subclass IIIe: Soils subject to severe erosion if they are cultivated and not protected.

Capability unit IIIe–5. Deep, well-drained, moderately permeable, moderately sloping, eroded soils that have a sandy loam surface layer and a high available moisture capacity.

Capability unit IIIe–33 Deep, somewhat excessively drained, rapidly permeable, moderately sloping soils that have a loamy sand surface layer and a low to moderate available moisture capacity.

Subclass IIIw: Soils severely limited for cultivation because of excess water.

Capability unit IIIw–6. Poorly drained and very poorly drained, moderately permeable soils that have a sandy loam surface layer and a moderate to high available moisture capacity

Capability unit IIIw–7. Poorly drained and very poorly drained, moderately permeable soils that have a loam surface layer and a moderate to high available moisture capacity.

Capability unit IIIw–9. Poorly drained, slowly permeable soils that have a sandy loam surface layer and a high available moisture capacity.

Capability unit IIIw–10. Moderately well drained to somewhat poorly drained, rapidly permeable soils that have a loamy sand surface layer and a low available moisture capacity.

Capability unit IIIw–11. Poorly drained, slowly permeable soils that have a loam surface layer and a high available moisture capacity.

Subclass IIIs· Soils severely limited for cultivation by droughtiness.

Capability unit IIIs–1. Excessively drained, rapidly permeable, nearly level and gently sloping soils that have a loamy sand surface layer and a low available moisture capacity, but have a moisture-retarding layer at some depth.

Class IV. Soils have very severe limitations that reduce the choice of plants, require very careful management, or both.

Subclass IVe: Soils subject to very severe erosion if they are cultivated and not protected.

Capability unit IVe–5. Deep, well-drained, moderately permeable, strongly sloping soils that have a sandy loam surface layer and a high available moisture capacity.

Capability unit IVe–9. Moderately well drained, slowly permeable, gently sloping, eroded soils that have a fine sandy loam surface layer and a high available moisture capacity.

Subclass IVw: Soils very severely limited by excess wetness.

Capability unit IVw–6 Poorly drained and very poorly drained, moderately rapidly permeable to rapidly permeable soils that have a surface layer of loamy sand and a low to very low available moisture capacity.

Capability unit IVw–7. Very poorly drained, organic soils that are subject to ponding.

Class V· Soils are not likely to erode but have other limitations, impractical to remove, that limit their use largely to pasture, woodland, or wildlife. (None in Sussex County.)

Class VI: Soils have severe limitations that make them generally unsuited to cultivation and limit their use largely to pasture, woodland, or wildlife. (None in Sussex County.)

Class VII: Soils that have very severe limitations that make them unsuited to cultivation and that restrict their use largely to pasture, woodland, or wildlife.

Subclass VIIw: Soils very severely limited by excess water.

Capability unit VIIw-1. Very poorly drained soils on flood plains and very wet, unclassified soils materials, more or less continually flooded or ponded.

Subclass VIIs. Soils very severely limited by low available moisture capacity, stones, or other soil features.

Capability unit VIIs–1. Excessively drained, rapidly permeable, gently sloping to strongly sloping soils that have a loamy sand and sand surface layer and a very low available moisture capacity.

Class VIII: Soils and landforms have limitations that preclude their use for commercial crop production and restrict their use to recreation, wildlife, or water supply, or to use for esthetic purposes.

Subclass VIIIw: Extremely wet, marshy land.

Capability unit VIIIw–1. Marsh lands that are subject to tidal flooding.

Subclass VIIIs: Stony land, coastal beaches, and other areas that have little potential for commercial crop production.

Capability unit VIIIs–2. Loose, incoherent sands of beaches and dunes.

Capability unit VIIIs–4. Land where large amounts of soil material have been removed.

To find the capability classification of any given soil, refer to the "Guide to Mapping Units" at the back of this publication or to the soil descriptions, pages 11 to 34. Use and management of each soil are suggested in the soil descriptions.

General Management Practices [3]

The management practices that are important on all or some soils of Sussex County are drainage, proper tillage, use of amendments, selection of cropping systems, management of irrigation water, and management of crop residue.

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[3] By Leo J. Cotnoir, associate professor, Department of Plant Science, College of Agricultural Sciences, University of Delaware.

Drainage

About 30 percent of the acreage of Sussex County consists of either poorly drained or very poorly drained soils that cannot be farmed successfully unless they are artificially drained. Another 12 percent consists of moderately well drained soils on which no improved drainage is needed if they are used for hay or pasture, but some improved drainage is desirable for all cultivated crops and is necessary for some. About 40 percent of the acreage of the poorly drained Elkton, Fallsington, and Osier soils and the very poorly drained Berryland, Johnston, Pocomoke, Portsmouth, and Rutlege soils and Muck is currently cropped.

Open ditches are used almost exclusively. Tile drains, however, should function well in all but Elkton soils and Muck. Difficulties in drainage relate chiefly to elevation above adequate outlets and distance from them. Systems must be carefully planned and maintained if they are to perform properly.[4]

Almost 60 percent of the acreage of the moderately well drained Keyport, Klej, Matawan, and Woodstown soils is cultivated Drainage can be improved easily on all of these soils, but is more difficult on Keyport soils.

Tillage

All but Elkton and Keyport soils can be tilled easily and rapidly. Plowing or working Elkton and Keyport soils when they are too wet or too dry results in puddling or clodding, and excessive tillage results in the breakdown of soil structure. Excessive tillage on most other soils in the county results only in the loss of organic matter.

The most important practice on soils that have a plow layer of loamy sand is firming of the seedbed. Such soils make up nearly 45 percent of the county Plowing or disking these soils tends to leave the surface layer excessively loose Unless the soil is packed around the seed, moisture is not always adequate for germination Press wheels are used for packing.

Tillage in excess of that needed for good seedbed preparation should be avoided because it loosens the soil. The loose soil blows if it is sandy, and blowing sand cuts and covers tender seedlings. Temporary windbreaks that can be removed after plants are well established help to prevent or alleviate this kind of seedling damage.

Soil amendments

All soils in Sussex County are acid and are fairly low in natural fertility. Applications of lime and fertilizer are essential to crop production. The amount of lime necessary to bring the soils from their very strongly acid or extremely acid natural condition up to the slightly acid condition desirable for most crops is between 3 and 6 tons of ground limestone per acre. The exact amount depends on the texture and organic-matter content of the plow layer. Maintenance applications should be made on the basis of soil tests; about a ton of ground limestone per acre every 3 or 4 years is commonly needed. Overliming results in micronutrient deficiencies, particularly if the plow layer is sand or loamy sand.

The soils are naturally deficient in nitrogen. Time of nitrogen application is important, especially on sands or loamy sands, where leaching can be expected unless nitrogen is applied at the time of crop need. The soils are also low in phosphorous, but a high to very high level of phosphorous is common as the result of normal fertilization over a long period. Potassium fertilizer can be applied somewhat ahead of actual crop needs on soils that have a surface layer of loam or sandy loam, but it is best applied no more than a week or two before planting on soils that have a surface layer of sand or loamy sand.

Magnesium, in which all soils of the county are deficient, is most economically applied by using dolomitic limestone in liming operations. Application of excessive amounts of magnesium should be avoided, especially on the sandier soils.

Micronutrient levels are low in all the soils, but response of crops to additions of these micronutrients is not always obtained. Boron is essential for alfalfa. Soybeans respond to manganese applications on limed soils. Other micronutrient additions should be made on the basis of specific recommendations for specified crops on certain soils.

Irrigation

Drought is a hazard on many soils of the county. The sands and loamy sands range from very low to moderate in available moisture capacity. Crops on these soils fail on an average of 1 year in 3, maximum yields are almost never achieved without supplemental irrigation. The finer textured soils of the county have sufficient moisture available to produce satsifactory crops in most years, but they seldom hold enough moisture for maximum yields without supplemental irrigation.

Sassafras soils are the most commonly irrigated soils in the county and the best suited to irrigation. They have a sufficiently high infiltration rate and available moisture capacity that water need not be applied in very large amounts or at very frequent intervals.

Only a small acreage of Evesboro, Kenansville, and Rumford soils is irrigated. Because their moisture-holding capacity is low, these soils require additional water at intervals too frequent to be economical if irrigation pipes must be moved by hand. Solid-set systems eliminate this problem, and a great increase in irrigation of these soils is expected in the future.

Production of vegetable crops is practical and economical only under irrigation, so nearly all vegetable areas in the county are irrigated. Some corn is irrigated and more is expected to be irrigated in the future. Soybeans cannot be irrigated profitably at the present time on any soils in the county, but they may be irrigated in the future.

The soil characteristics that affect irrigation practices vary from soil to soil. The Delaware Guide for Sprinkler Irrigation Design [5] should be consulted before planning irrigation systems.

Crop residue management

Because the organic-matter content is low in all but the very poorly drained soils of the county, it is important that all crop residue be incorporated into the soil. Cover

[4] UNITED STATES DEPARTMENT OF AGRICULTURE. DELAWARE AGRICULTURAL DRAINAGE GUIDE. (In cooperation with Univ. of Del) [Mimeographed] 1962.

[5] UNITED STATES DEPARTMENT OF AGRICULTURE. DELAWARE GUIDE FOR SPRINKLER IRRIGATION DESIGN. (In cooperation with Univ. of Del. Expt. Sta.) 1955.

crops, most commonly rye and barley, also supply large amounts of organic matter. These crops should be plowed under fairly early in spring, usually no later than April 1. Growth is very rapid after this date, and plowing under becomes increasingly difficult. Depletion of soil moisture also is rapid if cover crops are left unplowed after this approximate date.

Cover crops help retard erosion on the sloping Keyport, Rumford, and Sassafras soils of capability units IIe-4, IIe-5, IIIe-5, IIIe-33, IVe-5, and IVe-9. Leaving crop residue, chiefly from corn and soybeans, on the undisturbed surface of these soils also helps prevent erosion.

Cover crops help prevent leaching of plant nutrients left in the soil after crops are harvested. Fertilizer, especially nitrogen, can be applied earlier in the season if there is a good cover crop on the soil.

Cover crops and crop residue turned under help to keep soils in good tilth. They are especially effective on Elkton loam, Fallsington loam, Sassafras loam, and Woodstown loam. The organic-matter content cannot be significantly increased, nor is this essentially desirable. The objective of residue management is to maintain a good turnover of decomposing residue. The use of adequate amounts of nitrogen to insure decomposition of cover crops and crop residue is highly important.

Cropping systems

The cropping systems used in Sussex County are generally short term. The most common rotation is corn, barley, and soybeans. Continuous growth of corn and a winter cover crop is common. This practice can be considered a 1-year rotation and is satisfactory on most soils of the county.

Most vegetables are also grown year after year with a winter cover crop. Peas are commonly followed by lima beans or snap beans in the same year.

These short cropping systems are generally satisfactory from a conservation or erosion control viewpoint, because most cropland in the county is nearly level or gently sloping and the hazard of erosion is only slight. Soils on which the erosion hazard is moderate or severe make up only about 2 percent of the land suited to farming.

Estimated Yields

Table 4 shows estimated average yields of the common field crops and production levels for orchard crops under the generally high level of management that is common in Sussex County. It is assumed that rainfall is near normal and fairly well distributed throughout the season. It is also assumed that—

1. Drainage has been improved on those soils that need it, and the drainage systems are well maintained.
2. Winter cover crops are used for winter protection, to reduce nutrient leaching, and to provide organic matter.
3. Adequate nitrogen, either as manure (especially poultry manure, which is available in large amounts in the county) or commercial fertilizer, is used to decompose cover crops and residue.
4. Fertilizer and lime are applied according to crop needs and soil levels as indicated by soil tests.
5. Seedbeds are adequately prepared and seedings made according to recommended practice. This includes seedbed packing on the soils that have a sandy surface, especially loamy sand; and care to avoid working the finer textured soils when they are too wet or too dry.
6. Proper weed control methods are used.
7. Planting, cultivating, and harvesting are done at the proper time and in recommended ways.
8. Recommended, adapted varieties are used.
9. Diseases and insects are controlled to the extent usually considered feasible.

The yields in table 4 have been coordinated across State and regional lines for specifically named soils. They do not represent the highest yields obtainable, but are practical goals that most farmers may reach in favorable years. At times they are exceeded. Yields on any one kind of soil can be expected to vary under the best management as a result of differences in local and yearly weather, differences in crop variety, and prevalence of diseases or insects.

Table 5 gives the estimated yields of the commercial truck or vegetable crops commonly grown in the county. These yields are based on farmer experience and cannery purchases. They represent normally attainable goals. It is assumed that all the cultural practices in the foregoing list have been followed. In addition, it is assumed that irrigation is available to supplement natural rainfall. In most cases, these yield estimates for truck crops have not been coordinated across State or regional lines.

Woodland

According to the Delaware Conservation Needs Inventory, woodland covered about 259,000 acres in Sussex County in 1967, or about 43 percent of the total land area. The most heavily wooded areas are in the central and southern parts of the county on soils that are not well drained.

The woodlands have been thoroughly cut over. The dominant trees are hardwoods, including oaks, sweetgum, yellow-poplar, red maple, blackgum, holly, sweetbay, beech, birch, and dogwood. Sussex County is at the approximate northern limit of natural distribution of loblolly pine, which is probably the most valuable timber species in the county. There are some excellent stands, particularly on lands that were cleared or at least severely cut over and since then have naturally rewooded (fig. 15). Loblolly pine is the first-choice species for planting on all soils of the county

Virginia pine grows on well-drained uplands and is most common on Evesboro, Kenansville, and Rumford soils. Some pond pine grows on the poorly drained Berryland, Johnston, Pocomoke, Portsmouth, and Rutlege soils, and on Muck. On some of these soils and on Swamp, there are a few remaining cedar and cypress trees.

Management of woodland

Information on wood crops and factors that affect woodland management can be found in table 6.

Hazards and limitations that affect woodland management are expressed as *slight*, *moderate*, or *severe* in table 6 Equipment limitations vary according to characteristics that restrict or prohibit the use of heavy equipment com-

TABLE 4.—*Estimated average yields per acre of field crops and production levels for orchard crops under improved management*

[Absence of a figure indicates that the crop is not suited to the soil specified or is not commonly grown on it. Soils and land types not listed in this table are not suitable for the crops shown]

Soil	Corn for grain	Corn for silage	Soybeans	Wheat	Barley	Rye	Alfalfa hay	Clover-grass hay	Tall grass-legume pasture	Production level for—	
										Apples	Peaches
	Bu	*Tons*	*Bu*	*Bu*	*Bu*	*Bu*	*Tons*	*Tons*	*Cow-acre-days* [1]		
Berryland loamy sand	65	13	20			25					
Elkton sandy loam	105	21	35	30	40	30		3.5	200		
Elkton loam	105	21	35	30	40	30		3.5	200		
Evesboro sand, 0 to 5 percent slopes									100		
Evesboro loamy sand, 5 to 15 percent slopes.									120	Poor	Poor.
Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes.	100	20	35	30	70	25	2.5	2.0	155	Fair	Fair.
Evesboro loamy sand, loamy substratum, 2 to 5 percent slopes.	90	18	30	25	60	20	2.0	2.0	140	Fair	Fair.
Fallsington sandy loam	120	24	35	35	70	35		3.0	170		
Fallsington loam	120	24	35	35	70	35		3.0	170		
Johnston silt loam									170		
Kalmia sandy loam	130	26	40	50	90	35	5.5	3.5	315	Good	Good.
Kenansville loamy sand, 0 to 2 percent slopes.	110	22	35	35	60	30	4.0	2.5	225	Fair	Fair.
Kenansville loamy sand, 2 to 5 percent slopes.	100	20	30	30	50	25	4.0	2.5	225	Fair	Fair.
Keyport fine sandy loam, 0 to 2 percent slopes.	110	22	35	40	55	30	3.5	3.0	170	Fair	Fair.
Keyport fine sandy loam, 2 to 5 percent slopes, eroded.	90	18						2.0	140	Poor	Poor.
Klej loamy sand	110	22	30	35	70	25		3.0	170		
Matawan loamy sand	110	22	35	35	60	30	4.0	2.5	225	Fair	Fair.
Matawan sandy loam	120	24	35	40	70	30	4.5	3.5	255	Fair	Fair.
Muck, shallow	120	24	35								
Osier loamy sand	100	20	35		70	25		2.0	155		
Pocomoke sandy loam	120	24	35	35	70	35		3.0	170		
Portsmouth loam	120	24	35	35	70	35		3.0	170		
Rumford loamy sand, 0 to 2 percent slopes	120	24	40	50	70	30	5.0	3.5	285	Fair	Fair.
Rumford loamy sand, 2 to 5 percent slopes	110	22	35	45	60	30	4.5	3.5	285	Fair	Fair.
Rumford loamy sand, 5 to 10 percent slopes.	100	20	35	30	60	30	4.5	3.5	285	Fair	Fair.
Rutlege loamy sand	100	20	35		70	25		2.0	155		
Sassafras sandy loam, 0 to 2 percent slopes	130	26	40	50	90	35	5.5	3.5	315	Good	Good.
Sassafras sandy loam, 2 to 5 percent slopes	130	26	40	50	90	35	5.5	3.5	315	Good	Good.
Sassafras sandy loam, 5 to 10 percent slopes, eroded.	120	24	35	45	90	35	5.0	3.0	285	Good	Good.
Sassafras sandy loam, 10 to 15 percent slopes.	100	20		40	75	35	4.5	3.0	285	Good	Good.
Sassafras loam, 0 to 2 percent slopes	140	28	40	50	90	35	5.5	3.5	315	Good	Good.
Sassafras loam, 2 to 5 percent slopes	140	28	40	50	90	35	5.5	3.5	315	Good	Good.
Woodstown sandy loam	130	26	40	40	80	35	4.5	3.5	255	Fair	Fair.
Woodstown loam	135	27	40	40	80	35	4.5	3.5	255	Fair	Fair.

[1] Cow-acre-days is a term used to express the carrying capacity of pasture. It is the number of animal units carried per acre multiplied by the number of days the pasture can be grazed during a single grazing season without injury to the sod. An acre of pasture that provides 30 days of grazing for 2 cows has a carrying capacity of 60 cow-acre-days.

monly used in tending and harvesting trees. In Sussex County these characteristics commonly are extreme sandiness or extreme seasonal wetness associated with a high water table. Seedling mortality refers to the loss of naturally occurring or planted tree seedlings as a result of unfavorable soil properties. Plant competition refers to invasion by or growth of undesirable vegetation, such as weeds, shrubs, and vines, when openings are made in the forest canopy. Such competition particularly affects desirable species in the seedling and sapling stages.

Two other factors that sometimes affect woodland management are not listed in table 6. One is the hazard of windthrow. The other is the hazard of erosion. The windthrow hazard is not significant because none of the soils of Sussex County have characteristics that inhibit the development of tree roots. Winds of high velocity, of course, can cause some windthrow on any kind of soil. For woodland purposes, the hazard of erosion is slight on all the soils of the county.

Woodland classes and subclasses

The soils of Sussex County have been evaluated and grouped according to a nationwide system put into use by woodland conservationists of the Soil Conservation

TABLE 5.—*Estimated average yields per acre of truck crops under improved management*

[Absence of a figure indicates that the crop is not suited to the soil specified or is not commonly grown on it. Soils and land types not listed in this table are not suitable for the crops shown]

Soil	Asparagus	Cantaloupes	Carrots	Cucumbers	Lima beans	Peas	Peppers	Snap beans	Squash and pumpkins	Sweet corn	Tomatoes	Italian tomatoes	Watermelons
	Tons	*Bu*	*Tons*	*Bu*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*	*Tons*
Evesboro sand, 0 to 5 percent slopes													10
Evesboro sand, 5 to 15 percent slopes													10
Evesboro loamy sand, 5 to 15 percent slopes		225							8				10
Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes	2.0	275	15	500	1.0	1.5	5	2.0	10	5.0	18	25	15
Evesboro loamy sand, loamy substratum, 2 to 5 percent slopes	2.0	205	12	450	1.0		4	2.0	10	4.0	15	20	15
Fallsington sandy loam							5		10	5.0	15	20	
Fallsington loam							5		10	5.0	15	20	
Kalmia sandy loam	1.0	300	20	750	1.7	2.0	8	3.0	14	6.0	25	33	15
Kenansville loamy sand, 0 to 2 percent slopes	1.0	275	15	500	1.0	1.5	5	2.0	10	5.0	18	25	15
Kenansville loamy sand, 2 to 5 percent slopes		250	12	450	1.0	1.5	4	2.0	10	4.0	15	20	15
Keyport fine sandy loam, 0 to 2 percent slopes		250	18				6		15	5.0	22	29	
Keyport fine sandy loam, 2 to 5 percent slopes, eroded		200	14				4		10	4.0	18	24	
Klej loamy sand	2.0	250	12	450	1.0	1.5	5	2.5	10	4.0	18	24	
Matawan loamy sand	2.0	250	12	450	1.0	1.5	5	2.0	10	4.0	18	25	10
Matawan sandy loam	2.0	250	15	650	1.5	1.7	6	2.5	15	5.0	22	29	
Osier loamy sand				350	1.0		4	2.0	8	3.5	15	20	
Rumford loamy sand, 0 to 2 percent slopes	2.0	275	15	500	1.0	1.5	5	2.0	10	5.0	18	25	15
Rumford loamy sand, 2 to 5 percent slopes		275	15	500	1.0	1.5	5	2.0	10	5.0	18	25	15
Rumford loamy sand, 5 to 10 percent slopes		250	12	350	1.0	1.5	5	2.0	10	4.0	16	22	15
Rutlege loamy sand													15
Sassafras sandy loam, 0 to 2 percent slopes	2.5	300	20	750	1.7	2.0	8	3.0	14	6.0	25	33	15
Sassafras sandy loam, 2 to 5 percent slopes		300	20	750	1.7	2.0	8	3.0	14	6.0	25	33	15
Sassafras sandy loam, 5 to 10 percent slopes, eroded		300	15	700	1.5	1.7	8	2.5	14	6.0	25	33	15
Sassafras sandy loam, 10 to 15 percent slopes		275	15	600	1.0	1.7	6	2.5	12	5.0	23	30	15
Sassafras loam, 0 to 2 percent slopes	2.5	325	20	750	1.7	2.0	8	3.0	14	6.0	25	33	15
Sassafras loam, 2 to 5 percent slopes		325	20	750	1.7	2.0	8	3.0	14	6.0	25	33	15
Woodstown sandy loam	2.0	275	15	700	1.5	1.7	6	2.5	14	5.0	22	29	
Woodstown loam	2.0	275	15	700	1.5	1.7	6	2.5	14	5.0	22	29	

Service. In this system, known as ordination, soils are placed in woodland classes according to their potential productivity for woodland species and in subclasses according to their inherent limitations, if any, for woodland management.

Potential productivity is expressed as a site index, which is the height, in feet, that a specified kind of tree growing on a specified soil will reach in 50 years.

The woodland classification of the soils of Sussex County is based mainly on the site indexes for loblolly pine. This is the only species for which a site index has been established on nearly every soil. Site indexes for sweetgum have been established for some soils, and site indexes for oak and Virginia pine for a few soils. The determinations were made in Delaware and in nearby parts of Maryland and New Jersey.

On the basis of their relative productivity for loblolly pine, the soils of Sussex County have been placed in three of the five classes in the system: class 2, made up of soils of high productivity (site index for loblolly pine 85 to 95); class 3, made up of soils of medium productivity (site index 75 to 85); and class 5, made up of soils of very low productivity (site index less than 65). None are in class 1, which would consist of soils of very high productivity (site index more than 95), or in class 4, which would consist of soils of low productivity (site index for loblolly pine 65 to 75).

The soils of Sussex County are in subclasses identified as follows: subclass *o*, no limitations; subclass *w*, limitations due to seasonal wetness or a high water table; subclass *s*, limitations due to excessive sandiness; and subclass *t*, limitations due to toxic substances in the soil.

The woodland subclass of each soil is shown in table 6, at the end of the soil description, and in the "Guide to Mapping Units."

Figure 15.—**Excellent young stand of loblolly pine in a naturally rewooded area of Fallsington sandy loam.**

Descriptions of the seven woodland subclasses follow.

WOODLAND SUBCLASS 2o

Soils of this subclass are highly productive and have no major limitations for woodland management. They are moderately well drained to well drained and nearly level.

In a normal stand 50 years of age, the average annual increase per acre is 275 board feet of timber for mixed oaks; 490 board feet of timber for yellow-poplar; and 680 board feet of timber, or 0.7 cord of pulpwood, for loblolly pine.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 4,000 board feet of timber, or 46 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 16,500 board feet of timber, or 71 cords of pulpwood per acre. At 70 years of age, they yield about 26,000 board feet of timber, or 82 cords of pulpwood. Yields of other species are less.

WOODLAND SUBCLASS 2w

Soils of this subclass are highly productive, but seasonal wetness and a high water table severely limit use of heavy equipment. Seedling mortality is moderate to severe because the soils are wet. Flooding is a hazard on the Johnston soils, and some areas of other soils in the subclass are seasonally ponded because they are in depressions that do not have natural or artificial outlets.

In a normal stand 50 years of age, the average annual increase per acre is 275 board feet of timber for mixed oaks and 680 board feet of timber, or 0.7 cord of pulpwood, for loblolly pine.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 4,000 board feet of timber, or 46 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 16,500 board feet of timber, or 71 cords of pulpwood per acre. At 70 years of age, they yield about 26,000 board feet of timber, or 82 cords of pulpwood.

Reliable estimates of yield of sweetgum are not available. Muck normally does not support stands of hardwoods in Sussex County. Yellow-poplar does well on other soils of this woodland subclass that have been artificially drained to such degree that the water table is high for only short periods.

WOODLAND SUBCLASS 2s

Soils of this subclass are highly productive but a loose, sandy surface layer and seasonal droughtiness moderately limit the use of heavy equipment. Seedling mortality is moderate. A loamy layer at a depth between 40 and 72 inches that is more retentive of moisture than the loose sandy material above it serves as a reservoir of moisture for the deep roots of trees. This characteristic makes the

soil at least one class more productive of timber than soils that do not have this moisture-retaining loamy layer.

In a normal stand 50 years of age, the average annual increase per acre is 275 board feet of timber for mixed oaks; 490 board feet of timber for yellow-poplar; and 1.9 cords of pulpwood for Virginia pine.

At 30 years of age, fully stocked, natural unmanaged stands of loblolly pine yield about 4,000 board feet of timber, or 46 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 16,500 board feet of timber, or 71 cords of pulpwood per acre. At 70 years of age, they yield about 26,000 board feet of timber, or 82 cords of pulpwood. At 30 years of age, a fully stocked stand of Virginia pine yields about 57 cords of pulpwood per acre, and at 50 years of age, about 95 cords.

WOODLAND SUBCLASS 3o

Soils of this subclass are moderately productive and have no major limitations for woodland management. They are dominantly nearly level to gently sloping, but locally some slopes are as much as 15 percent.

In a normal stand 50 years of age, the average annual increase per acre is 200 board feet of timber for mixed oaks; 350 board feet of timber for yellow-poplar; 470 board feet of timber, or 1 cord of pulpwood, for loblolly pine; and 1.1 cord of pulpwood for Virginia pine.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 2,000 board feet of timber, or 38 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 11,500 board feet of timber, or 60 cords of pulpwood. At 70 years of age, they yield about 19,500 board feet of timber, or 70 cords of pulpwood. At 30 years of age, a fully stocked stand of Virginia pine yields about 33 cords of pulpwood per acre, and at 50 years of age, about 54 cords. Reliable estimates of yields of yellow-poplar, sweetgum, and mixed oaks are not available.

WOODLAND SUBCLASS 3w

Soils of this subclass are moderately productive, but seasonal wetness and a high water table severely limit use of heavy equipment. The Elkton and Keyport soils have a subsoil that is plastic when wet, which is an additional limitation to the use of heavy equipment during wet periods.

In a normal stand 50 years of age, the average annual increase per acre is 200 board feet of timber for mixed oaks and 470 board feet of timber, or 1 cord of pulpwood, for loblolly pine.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 2,000 board feet of timber, or 38 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 11,500 board feet of timber, or 60 cords of pulpwood. At 70 years of age, they yield about 19,500 board feet of timber, or 70 cords of pulpwood. Yields of other species are less.

WOODLAND SUBCLASS 3s

Soils of this subclass are moderately productive, but a loose, sandy surface layer and seasonal droughtiness moderately limit use of heavy equipment. Seedling mortality is moderate.

In a normal stand 50 years of age, the average annual increase per acre is 1.1 cords of pulpwood for Virginia pine and 470 board feet of timber, or 1 cord of pulpwood, for loblolly pine.

At 30 years of age, fully stocked, natural, unmanaged stands of loblolly pine yield about 2,000 board feet of timber, or 38 cords of pulpwood per acre (Doyle rule). At 50 years of age, the stands yield about 11,500 board feet of timber, or 60 cords of pulpwood. At 70 years of age, they yield about 19,500 board feet of timber, or 70 cords of pulpwood. At 30 years of age, a fully stocked stand of Virginia pine yields about 33 cords of pulpwood per acre, and at 50 years of age, about 52 cords.

WOODLAND SUBCLASS 5t

Soils of this subclass are very low in productivity. Salinity and the looseness and instability of the sand severely limit use of equipment. Seedling mortality is severe. There are few trees except some scattered Virginia pine on the dunes. Loblolly pine is preferred for planting, but it grows so slowly on the land types of this subclass that no estimates of yields have been made.

Wildlife [6]

Sussex County has abundant and varied wildlife resources valuable to the economy. There are good populations of deer, quail, rabbits, and waterfowl that are heavily hunted during open season and, along with other wildlife, are enjoyed by both visitors and local residents throughout the year. Some birds are also important in helping control insect pests, and others consume large quantities of weed seeds. Such predators as skunk, foxes, hawks, and owls help keep small rodents in check.

The landscape is one of generally level relief, complex soil and drainage patterns, and fields interspersed with wooded areas and shrubby growth along ditches This extensive edge habitat is valuable to upland wildlife. Throughout the county open ditch rights-of-way through poorly drained woods provide quality habitat for deer, quail, rabbits, and other upland wildlife. The grassy bottoms of shallow ditches are heavily used by wetland wildlife throughout the year.

Suitability of soils as wildlife habitat

The wildlife population of any area depends on the availability of food, cover, and water in a suitable combination. Habitat for an individual bird or animal species or group of species is created, improved, and maintained by establishing and maintaining the required combinations of vegetation for food and cover.

In table 7 the soils of the county are rated according to their natural suitability for the establishment and maintenance of major elements of wildlife habitat (*1*). A rating of *good* means that the soil is well suited and has few or no limitations for the elements of habitat and that habitat can be established and maintained with little difficulty. *Fair* means the soil has limitations that require more intensive efforts to establish and maintain habitat elements. A rating of *poor* indicates that habitat elements can be created, improved, or maintained, but the soil has severe limitations that require intensive efforts to overcome. *Not suited* indicates that it is impractical or impossible to establish and maintain habitat elements in a manner valuable to wildlife.

[6] By EUGENE A. WHITAKER, wildlife biologist, Soil Conservation Service.

TABLE 6.—*Wood crops and*

Soil series and map symbols	Woodland subclass	Equipment limitations	Seedling mortality	Plant competition for—	
				Conifers	Hardwoods
Berryland: Bd	3w	Severe: high water table, ponding, very poor trafficability when wet.	Severe	Severe	Severe
Borrow pits: Bo No woodland classification.					
Coastal beach and dune land: Co	5t	Severe: loose, unstable sand	Severe	Severe	
Elkton: El, Em	3w	Severe: high water table; plastic subsoil.	Moderate	Severe	Moderate
Evesboro:					
EoB, EoD, EsD	3s	Moderate: loose, sandy	Moderate	Slight	Slight
EvA, EvB	2s	Moderate: loose, sandy	Moderate	Moderate	Slight
Fallsington: Fa, Fs	2w	Severe: high water table	Moderate	Severe	Moderate
Fill land: Ft No woodland classification.					
Johnston: Jo	2w	Severe: high water table; flooding	Severe	Severe	Severe
Kalmia: Ka	2o	Slight	Slight	Moderate	Moderate
Kenansville: KbA, KbB	3o	Slight	Slight to moderate.	Moderate	Slight
Keyport: KfA, KfB2	3w	Severe. moderately high water table, plastic subsoil.	Slight	Severe	Moderate
Klej: Kl	3s	Moderate: sandy; poor trafficability when wet.	Slight	Moderate	Slight
Matawan: Mm, Mn	2o	Slight	Slight	Moderate	Moderate
Muck, shallow: Mu	2w	Severe: high water table; ponding; no trafficability when wet.	Severe	Severe	Severe
Osier: Os	2w	Severe: high water table, ponding, poor trafficability when wet.	Moderate	Severe	Moderate
Pocomoke: Pm	2w	Severe: high water table; ponding	Moderate	Severe	Moderate
Portsmouth: Pt	2w	Severe high water table; ponding.	Moderate	Severe	Moderate
Rumford: RuA, RuB, RuC	3o	Slight	Slight to moderate.	Moderate	Slight
Rutlege: Ry	2w	Severe: high water table; ponding; very poor trafficability when wet.	Severe	Severe	Severe
Sassafras: SaA, SaB, SaC2, SaD, SfA, SfB	3o	Slight	Slight	Moderate	Moderate

See footnotes at end of table.

factors in management

Site index [1]				Species to be favored—		
Loblolly pine	Mixed oaks	Sweet-gum	Virginia pine	In native stands	In planting	For Christmas trees
75–85				Loblolly pine, sweetgum, red maple, mixed oaks.	Loblolly pine, sweetgum	Scotch pine, white pine.
45–55			35–55	Generally none	Loblolly pine	None.
75–85	65–75	75–85		Loblolly pine, sweetgum, red maple, mixed oaks.	Loblolly pine, sweetgum	Scotch pine, white pine.
75–85			65–75	Loblolly pine, Virginia pine	Loblolly pine, Virginia pine	Scotch pine, white pine, Virginia pine.
85–95	75–85	85–95	75–85	Loblolly pine, sweetgum, mixed oaks, Virginia pine	Loblolly pine, Virginia pine	Scotch pine, white pine, Virginia pine.
85–95	75–85	85–95		Loblolly pine, white oak, red maple, sweetgum.	Loblolly pine, sweetgum, white pine.	Scotch pine, white pine, Norway spruce.
85–95		85–95		Loblolly pine, sweetgum, red maple, mixed oaks.	Loblolly pine, sweetgum, white pine.	Scotch pine, white pine.
85–95	75–85			Loblolly pine, yellow-poplar, mixed oaks.	Loblolly pine, yellow-poplar, white pine, sweetgum.	Scotch pine, Austrian pine, white pine.
75–85	65–75		65–75	Loblolly pine, Virginia pine, mixed oaks.	Loblolly pine, Virginia pine.	Scotch pine, white pine, Virginia pine.
75–85	65–75	75–85		Loblolly pine, white oak, sweetgum, red maple.	Loblolly pine, white pine, sweetgum.	Scotch pine, Austrian pine, white pine.
75–85	65–75	75–85		Loblolly pine	Loblolly pine	Scotch pine.
85–95	75–85	85–95		Loblolly pine, yellow-poplar, sweetgum, mixed oaks.	Loblolly pine, yellow-poplar, sweetgum, white pine.	Scotch pine, white pine.
85–95				Loblolly pine, cypress	Loblolly pine	None.
85–95		85–95		Loblolly pine, sweetgum, red maple.	Loblolly pine, sweetgum	Scotch pine, white pine.
85–95		85–95		Loblolly pine, sweetgum, red maple, mixed oaks.	Loblolly pine, sweetgum, white pine.	Scotch pine, white pine, Norway spruce.
85–95		85–95		Loblolly pine, sweetgum, red maple, mixed oaks.	Loblolly pine, sweetgum, white pine.	Scotch pine, white pine, Norway spruce.
75–85			65–75	Loblolly pine, Virginia pine, mixed oaks.	Loblolly pine, Virginia pine.	Scotch pine, white pine.
85–95				Loblolly pine, sweetgum, red maple, mixed oaks.	Loblolly pine, sweetgum	Scotch pine, white pine.
75–85	65–75		65–75	Loblolly pine, yellow-poplar, mixed oaks.	Loblolly pine, yellow-poplar, white pine, sweetgum.	Scotch pine, Austrian pine, white pine.

TABLE 6.—*Wood crops and*

Soil series and map symbols	Woodland subclass	Equipment limitations	Seedling mortality	Plant competition for—	
				Conifers	Hardwoods
Swamp: Sw No woodland classification.					
Tidal marsh: Tf, Tm No woodland classification.					
Woodstown: Wo, Ws	2o	Slight	Slight	Moderate	Moderate

[1] A numerical means of expressing the quality of a forest site that is based on the height of the dominant stand at an arbitrarily chosen

TABLE 7.—*Suitability of soils for elements of*

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Woody plants	
				Hardwood	Coniferous
Berryland: Bd	Not suited	Not suited	Poor	Fair	Poor
Borrow pits: Bo Too variable to be rated					
Coastal beach and dune land: Co	Not suited	Not suited	Poor	Not suited	Not suited
Elkton: El, Em	Poor	Fair	Fair	Good	Fair
Evesboro:					
EoB, EoD	Not suited	Poor	Poor	Not suited	Not suited
EsD	Poor	Fair	Fair	Poor	Fair
EvA, EvB	Fair	Fair	Fair	Fair	Fair
Fallsington Fa, Fs	Fair	Fair	Fair	Good	Good
Fill land: Ft Too variable to be rated.					
Johnston: Jo	Not suited	Poor	Poor	Good	Poor
Kalmia Ka	Good	Good	Good	Good	Good
Kenansville: KbA, KbB	Fair	Fair	Fair	Fair	Fair
Keyport: KfA, KfB2	Fair	Good	Good	Good	Good
Klej: Kl	Poor	Fair	Fair	Fair	Good
Matawan:					
Mm	Fair	Fair	Fair	Fair	Fair
Mn	Fair	Good	Good	Good	Good
Muck, shallow: Mu	Poor	Poor	Poor	Good	Fair
Osier: Os	Poor	Poor	Fair	Fair	Fair
Pocomoke: Pm	Poor	Poor	Poor	Good	Fair
Portsmouth: Pt	Poor	Poor	Poor	Good	Fair
Rumford. RuA, RuB, RuC	Fair	Fair	Fair	Fair	Fair

factors in management—Continued

Site index [1]				Species to be favored—		
Loblolly pine	Mixed oaks	Sweet-gum	Virginia pine	In native stands	In planting	For Christmas trees
85–95	75–85	85–95	----------	Loblolly pine, yellow-poplar, sweetgum, mixed oaks, red maple.	Loblolly pine, yellow-poplar, sweetgum, white pine.	Scotch pine, white pine, Norway spruce.

age; for example, the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years.

wildlife habitat and kinds of wildlife

Elements of wildlife habitat—Continued			Kinds of wildlife		
Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland	Woodland	Wetland
Fair	Fair	Good	Not suited	Poor	Fair.
Not suited	Not suited	Not suited	Not suited	Not suited	Not suited.
Good	Good	Good	Fair	Good	Good.
Not suited	Not suited	Not suited	Poor	Not suited	Not suited.
Not suited	Not suited	Not suited	Poor	Fair	Not suited.
Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Fair	Fair	Good	Fair	Good	Fair.
Good	Fair	Not suited	Not suited	Poor	Good.
Not suited	Not suited	Not suited	Good	Good	Not suited.
Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Not suited	Not suited	Good	Good	Not suited.
Poor	Not suited	Poor	Fair	Fair	Poor.
Not suited	Not suited	Not suited	Fair	Fair	Not suited.
Poor	Not suited	Not suited	Good	Good	Not suited.
Good	Good	Good	Poor	Fair	Good.
Fair	Good	Good	Poor	Fair	Fair.
Good	Good	Good	Poor	Fair	Good.
Good	Good	Good	Poor	Fair	Good.
Not suited	Not suited	Not suited	Fair	Fair	Not suited.

TABLE 7.—*Suitability of soils for elements of*

Soil series and map symbols	Elements of wildlife habitat				
	Grain and seed crops	Grasses and legumes	Wild herbaceous upland plants	Woody plants	
				Hardwood	Coniferous
Rutlege: Ry	Poor	Poor	Fair	Fair	Fair
Sassafras:					
SaA, SaB, SfA, SfB	Good	Good	Good	Good	Good
SaC2, SaD	Poor	Fair	Good	Good	Good
Swamp: Sw	Not suited	Not suited	Not suited	Not suited	Not suited
Tidal marsh: Tf, Tm	Not suited	Not suted	Not suited	Not suited	Not suited
Woodstown: Wo, Ws	Fair	Good	Good	Good	Good

The following elements of wildlife habitat were rated for each soil:

Grain and seed crops.—Domestic grain-producing or seed-producing annual herbaceous plants, which produce food mainly as crop residue and in food patch plantings. Examples are corn, soybeans, barley, wheat, millet, and sunflower.

Grasses and legumes.—Domestic grasses and herbaceous legumes that are commonly planted for forage or erosion control but also provide habitat for wildlife. They may also be planted to provide nesting and feeding cover as well as food. Examples are lespedeza, alfalfa, clover, tall fescue, orchardgrass, reed canarygrass, lovegrass, and redtop.

Wild herbaceous upland plants.—Native or introduced grasses, legumes, and weeds that generally become established naturally but can be planted, and that are used by wildlife for food and cover. Examples are panicgrasses, wildrye, foxtail, barnyard grass, partridge pea, beggartick, lespedeza, pokeweed, dandelion, and other native forbs, commonly referred to as weeds.

Hardwood woody plants.—Mainly deciduous trees, shrubs, and woody vines that provide cover and food, mainly for upland wildlife. Examples are dogwood, sassafras, persimmon, alder, oak, cherry, viburnums, rose, autumn-olive, amur honeysuckle, hickory, honeysuckle, greenbrier, blackberry, and bayberry.

Coniferous woody plants.—Mainly native or introduced evergreen trees and shrubs that become established naturally but may be planted. They provide mainly cover for wildlife, but some use is made of tender new growth as browse. Their seeds or cones may also be utilized. The rating is based on the suitability of the soils for establishment and growth, although it may be necessary to top plants on better sites to provide the desired dense cover. Examples are Virginia pine, loblolly pine, Scotch pine, shortleaf pine, spruce, cedar, juniper, and yew.

Wetland food and cover plants.—Introduced and native plants that provide food and cover for ducks, geese, sandpipers, muskrats, and other wetland wildlife. Most occur naturally (fig. 16) but some can be planted. Examples are wild millet, smartweeds, bulrushes, sedges, switchgrass, and cattails. Fast-maturing varieties of grain and seed crops (for example, grain sorghum, Japanese millet, and buckwheat) that may be planted during dry periods in summer and will produce food for fall and winter use are also included.

Shallow water developments.—Very low impoundments that tend to back up water in marshes and other naturally wet areas. The water level is as much as 2 feet above the level of the ground. These developments are of special importance to waterfowl and to such animals as muskrats.

Excavated ponds.—Areas dug out into the water table and dependent largely on ground water. If in ditches or combined with low levees, they may also temporarily trap surface runoff. Since the water level in these ponds varies with the water table, soils that have a low or excessively fluctuating water table are rated poorer. For fish, ponds have to be dug deep enough to maintain a 3-foot level in most of the pond during the driest part of the summer. For waterfowl, they need only be deep enough to hold about 1 foot of water during fall and early spring.

Suitability of soils for kinds of wildlife

Soils are also rated in table 7 in three groups as to their suitability for development of wildlife habitat. A rating of *good* means the soil is well suited, with few or no limitations for the creation or maintenance of quality habitat for species in the particular group. *Fair* means the soil has some limitations that require more intensive management, but satisfactory results can be expected. A rating of *poor* shows there are severe limitations that make habitat management difficult and expensive, and the results may not always be satisfactory. *Not suited* means it is impractical or impossible to improve or maintain habitat for the species in the group. These ratings refer only to the suitability of the soil and do not take into account the present use of the soil or the distribution of wildlife and human populations. These factors must be taken into account, making onsite inspection necessary prior to planning any individual area.

Each rating under "Kinds of wildlife" in table 7 is based on a weighted average of the ratings listed for the

wildlife habitat and kinds of wildlife—Continued

Elements of wildlife habitat—Continued			Kinds of wildlife		
Wetland food and cover plants	Shallow water developments	Excavated ponds	Openland	Woodland	Wetland
Good	Good	Good	Poor	Fair	Good.
Not suited	Not suited	Not suited	Good	Good	Not suited.
Not suited	Not suited	Not suited	Fair	Good	Not suited.
Good	Good	Not suited	Not suited	Not suited	Good.
Good	Good	Not suited	Not suited	Not suited	Good.
Poor	Not suited	Not suited	Good	Good	Not suited.

***Figure 16.*—Wetland food and cover plants on Tidal marsh, in the Primehook National Wildlife Refuge. Trees in background are on upland soils.**

habitat elements in the first part of the table. The elements most important to the wildlife group are the most important considerations in establishing the overall, weighted average. For openland wildlife the rating is based on the ratings shown for grain and seed crops, grasses and legumes, wild herbaceous upland plants, hardwood woody plants, and coniferous woody plants. The rating for woodland wildlife is based on the ratings listed for grasses and legumes, wild herbaceous upland plants, hardwood woody plants, and coniferous woody plants. For wetland wildlife the rating is based on the ratings shown for wetland food and cover plants, shallow water developments, and excavated ponds.

Openland wildlife.—Birds and mammals that normally frequent cropland, meadows, lawns, and areas of nonforested land overgrown with grasses, herbs, and shrubby growth. Examples are bobwhite quail, woodchucks, mourning doves, cottontail rabbits, skunks, field sparrows, meadowlarks, and killdeer.

Only 20 percent of the acreage in the county is naturally good for the development of habitat for openland wildlife. These are mainly the Sassafras and Woodstown loams and sandy loams, on which there is little difficulty in establishing the vegetative elements of habitat.

More than half the acreage, 56 percent, is fair for openland wildlife. Most of these soils, the Evesboro, Rumford, and Kenansville soils, for example, are coarse textured and somewhat droughty, both of which limit establishment of shrubs and other herbaceous growth. Once established, they support good habitat. Others, such as the Fallsington, Klej, and Osier soils, have impaired drainage that inhibits development of habitat, but they can be easily drained and, if drained, are good for establishment and maintenance of quality habitat.

Only 15 percent of the acreage is poor for upland wildlife. These are the very poorly drained soils, such as the Pocomoke soils that require extensive drainage, and the excessively droughty soils, such as the Evesboro soils. The open rights-of-way along ditches through areas of the very poorly drained soils and other soils are well suited to openland wildlife as well as to some typically woodland wildlife.

Less than 9 percent of the acreage is unsuitable as openland wildlife habitat.

Woodland wildlife.—Birds and mammals commonly found in wooded areas, although they may also utilize open areas. Among these are white-tailed deer, ruffled grouse, squirrels, raccoons, thrushes, towhees, gray foxes, and vireos.

Approximately 35 percent of the acreage of the county is potentially well suited to the development of habitat for woodland wildlife. The main soils in this group are Fallsington, Sassafras, and Woodstown, which are now largely in farm production. The rest of the soils, except for the poor to unsuited 9 percent, are fair for the development of habitat for woodland wildlife. These soils are either somewhat droughty or have impaired drainage, which presents some difficulty in establishment of trees. Once trees are established, these soils provide excellent habitat for woodland wildlife. About half the land in this rating group is now wooded.

Wetland wildlife.—Birds and mammals commonly found in swamps and marshes. Examples are ducks, herons, snipe, shore birds, mink, and muskrat.

Approximately 20 percent of the acreage of the county is well suited to wetland wildlife. About one-fifth of this acreage is Tidal marsh, mainly along the interior bays and their tributary streams in the southeastern section of the county. The marshes provide nutrients for finfish and shellfish in the bays and ocean. The grasses, sedges, and invertebrates growing on Tidal marsh provide food for waterfowl and other wetland wildlife. Creating small dug-out or blasted potholes in Tidal marsh increases the production of food for waterfowl and makes the areas accessible to waterfowl. Creation of shallow ponds through construction of low levees tied to high ground also increases the value of Tidal marsh as waterfowl habitat.

Woods predominate on the remaining 95,060 acres of soils that are well suited to wetland wildlife, except in areas that have been drained for production of crops. Natural wetland wildlife populations are low in all but the 5,960 acres of Swamp, mainly at the head of old millponds. The productivity of these areas can easily be improved by use of shallow excavations. Clearing and creation of shallow-water ponds on soils in this group in cultivated areas help attract and support large numbers of geese.

Fallsington soils make up most of the 15 percent of the acreage in the county rated fair for wetland wildlife. Their water table is at or near the surface during much of the year, and excavated ponds valuable to waterfowl can be easily created. In drained areas temporary blockage of ditches during fall and winter helps make considerable food available to waterfowl.

Klej is the only soil in the county rated poor for wetland wildlife. It commonly is in low spots in fields scattered over about 3 percent of the county. During wet years it produces food for wetland wildlife and can be excavated to provide open water.

The rest of the soils in the county, or 62 percent of the acreage, are not suited to the development of habitat for wetland wildlife.

Engineering Uses of the Soils [7]

This section is useful to those who need information about soils used as structural material or as foundations upon which structures are built. Among those who can benefit from this section are planning commissioners, town and city managers, land developers, engineers, contractors, and farmers.

Among the soil properties important in engineering are permeability, strength, compaction characteristics, drainage, shrink-swell potential, grain size, plasticity, and reaction. Also important are slope and depth to water table. These properties, in various degrees and combinations, affect construction and maintenance of roads, airports, pipelines, foundations for small buildings, irrigation systems, ponds and small dams, and systems for disposal of sewage and refuse.

Information in this section can be helpful to those who—

1. Select potential residential, industrial, commercial, and recreational areas.
2. Evaluate alternate routes for roads, highways, pipelines, and underground cables.
3. Seek sources of gravel, sand, or clay.

[7] EMORY L. SCHMERTZLER, State conservation engineer, Soil Conservation Service, helped prepare this section.

4. Plan farm drainage systems, irrigation systems, ponds, terraces, and other structures for controlling water and conserving soil.
5. Correlate performance of structures already built with properties of the kinds of soil on which they are built, for the purpose of predicting the performance of structures on the same or similar kinds of soil in other locations.
6. Predict the trafficability of soils for cross-country movement of vehicles and construction equipment.
7. Develop preliminary estimates pertinent to construction in a particular area.

Most of the information in this section is presented in tables 8, 9, and 10, which show, respectively, estimates of soil properties significant in engineering, interpretations of soil properties for various engineering uses, and results of engineering laboratory tests of soil samples.

This information, along with the detailed soil map and other parts of this publication, can be used to make interpretations in addition to those given in table 9 and also to make other useful maps.

This information, however, does not eliminate the need for further investigation at sites selected for engineering works, especially works that involve heavy loads or require excavations to depths greater than those shown in the tables. Also, inspection of sites, especially small ones, is needed because many delineated areas of a given mapping unit may contain small areas of other kinds of soil that have strongly contrasting properties and different suitabilities or limitations for engineering.

Some of the terms used in this soil survey have different meanings in soil science than in engineering. The Glossary defines many of these terms as they are commonly used in soil science.

Engineering classification systems

The two systems most commonly used in classifying soils for engineering purposes are the Unified system (*8*), which is used by the Soil Conservation Service, the Department of Defense, and others; and the AASHO system (*2*), developed by the American Association of State Highway Officials and generally used by highway engineers.

In the Unified system, soils are classified according to particle-size distribution, plastic properties, and organic-matter content Soils are grouped in 15 classes. They are identified as coarse grained (GW, GP, GM, GC, SW, SP, SM, and SC), fine grained (ML, CL, OL, MH, CH, and OH), and highly organic (Pt). The Unified classification for soils tested in Sussex County is given in table 10. The estimated Unified classification of all soils mapped in the county is given in table 8. As table 10 shows, some soils are borderline between two classes and have a classification, such as SP–SM, and some are in two classes, such as SC and CL. Table 8 shows that some soils have a sufficient range in properties to be placed in more than one classification group. For example, the subsoil of the Sassafras series, between depths of 14 and 31 inches, may prove to be either SM, SC, ML, or CL, depending upon a rather small range in certain properties.

In the AASHO system, soils are classified according to those properties that affect highway construction and maintenance. In this system, soils are placed in seven basic groups, on the basis of grain-size distribution, liquid limit, and plasticity index. The groups range from A–1, which consists of gravelly soils of high bearing capacity (the best soils for subgrades, but none are known in Sussex County), to A–7, which consists of clayey soils that have low bearing strength when wet. Where laboratory data are available to justify a further breakdown, the A–1, A–2, and A–7 groups are divided as follows: A–1–a, A–1–b, A–2–4, A–2–5, A–2–6, A–2–7, A–7–5, and A–7–6. The AASHO classification for each tested soil is shown in table 10. The estimated AASHO classification of every soil mapped in Sussex County is given in table 8. As table 8 shows, some soils have a sufficient range in properties to be placed in more than one classification group. For example, the subsoil of the Sassafras series, between depths of 14 and 31 inches, may prove to be either A–2, A–4, or A–6, depending upon a rather small range in certain properties.

Estimated properties

Table 8 gives estimates of some of the soil properties important in engineering. The estimates are based on field classification and descriptions, physical and chemical tests of selected representative samples, test data from the same soils or comparable soils in nearby counties and States, and detailed experience gained in working with the soils in Sussex County and elsewhere.

Depth to seasonal high water table is the distance from the surface of the soil downward to the highest level reached in most years by ground water.

Soil texture is described in the standard terms used by the Department of Agriculture. These terms take into account relative percentages of sand, silt, and clay particles in the soil material. "Loam," for example, is soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles. "Sand," "clay," and "silt" are defined in the Glossary.

The AASHO and Unified classifications are explained under the heading "Engineering classification systems."

Permeability, as used in table 8, relates only to the movement of water downward through undisturbed and uncompacted soil and does not include lateral seepage. The estimates are based on the structure and porosity of the soil, as well as on tests. Plowpans, surface crusts, and properties resulting from compaction by heavy machinery or by other means are not considered.

Available moisture capacity is the ability of the soil to hold water in a form available to plants.

Reaction is the degree of acidity or alkalinity of a soil. It is expressed in table 8 as a range in pH value; the values apply only to unlimed soils. The degree of acidity of each layer or horizon of each soil, as found in the field, is described verbally in the section "Descriptions of the Soils."

Optimum moisture is that moisture content, based on dry soil, at which a soil can be compacted to its greatest density by standard compaction methods. Maximum dry density is the maximum dry weight of 1 cubic foot of soil compacted by standard methods at the optimum moisture content. The figures for these two properties, taken together, are known as moisture-density data.

TABLE 8.—*Estimated soil properties*

[The symbol > means more than;

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Classification		
			USDA texture	Unified	AASHO
	Ft	*In*			
Berryland: Bd	0	0–16	Loamy sand or sand	SM, SP	A–2, A–3
		16–28	Loamy sand or sand	SM, SP	A–2, A–3
		28–50	Loamy sand or sand	SP–SM, SP	A–2, A–3
Borrow pits: Bo. No valid estimates can be made.					
Coastal beach and dune land: Co	1–10	0–96	Sand	SP	A–3
Elkton El, Em	0–1	0–12	Sandy loam or loam	SM, ML	A–2, A–4
		12–26	Sandy clay and sandy clay loam	CL, SC	A–6, A–7
		26–53	Clay, silty clay, and sandy clay	CL, CH	A–6, A–7
Evesboro:					
EoB, EoD	>10	0–60	Sand	SP	A–3
EsD	>10	0–31	Loamy sand	SM, SP	A–2, A–3
		31–76	Loamy sand or sand	SM, SP	A–2, A–3
EvA, EvB	>5	0–31	Loamy sand	SM, SP	A–2, A–3
		31–60	Loamy sand or sand	SM, SP	A–2, A–3
		70–76	Sandy loam and sandy clay loam	SM, SC, CL	A–2, A–4, A–6
Fallsington: Fa, Fs	0–1	0–12	Sandy loam or loam	SM, SC, ML	A–2, A–4
		12–23	Sandy loam, sandy clay loam	SM, SC, ML	A–2, A–4
		23–40	Sandy loam or loamy sand	SP, SM, SC	A–2, A–3
Fill land: Ft. No valid estimates can be made.					
Johnston: Jo	0	0–20	Silt loam	OL, OH, MH	A–4, A–5, A–7
		20–29	Loam or fine sandy loam	SM, ML	A–2, A–4
		29–55	Silt loam to sand	SP, SM, ML	A–2, A–3, A–4
Kalmia: Ka	>5	0–18	Sandy loam	SM	A–2, A–4
		18–30	Sandy loam, sandy clay loam	SC, CL	A–2, A–4
		30–53	Sandy loam or loamy sand	SM, SP	A–2, A–3
Kenansville: KbA, KbB	>5	0–22	Loamy sand	SM, SP–SM	A–2
		22–30	Sandy loam	SM	A–2
		30–58	Sand to sandy clay loam	SM, SP–SM	A–2
Keyport: KfA, KfB2	1½–2	0–5	Fine sandy loam	SM, ML	A–2, A–4
		5–48	Silty clay loam to clay	CL, CH	A–6, A–7
		48–54	Loamy fine sand	SM, SP–SM	A–2
Klej: Kl	2	0–16	Loamy sand	SM, SP–SM	A–2
		16–45	Sand, fine sand, loamy sand	SM, SP	A–2, A–3
		45–54	Sandy loam	SM, SC, ML	A–2, A–4
Matawan: Mm, Mn	2	0–22	Loamy sand or sandy loam	SM, SP–SM	A–2, A–4
		22–32	Sandy loam to clay loam	SC, CL, ML–CL	A–4, A–6
		32–50	Clay loam or sandy clay	SM, SC, CL	A–6, A–7
Muck, shallow: Mu	0	0–6	Muck	Pt	----------
		6–23	Muck	OL, OH	----------
		23–30	Loamy sand	SM, SP–SM	A–2, A–4
		30–56	Sand to silty clay loam	SP, SM, SC, CL, ML	A–2 to A–6
Osier: Os	0	0–26	Loamy sand	SM, SP–SM	A–2, A–3
		26–31	Loamy sand or sand	SM, SP	A–2, A–3
		31–60	Sand or loamy sand	SM, SP	A–2, A–3
Pocomoke: Pm	0	0–10	Sandy loam	SM	A–2, A–4
		10–31	Sandy loam	SM	A–2, A–4
		31–48	Loamy sand (stratified)	SM, SP	A–2, A–3

See footnotes at end of table.

significant in engineering

the symbol < means less than]

Percentage passing sieve—				Permeability [1]	Available moisture capacity	Reaction (unlimed)	Moisture-density data	
No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0 074 mm.)				Optimum moisture	Maximum dry density
				In /hr.	*In /in of soil*	*pH*	*Pct*	*Lb /cu ft*
95–100	95–100	80–100	5–20	2 0–6. 3	0. 06–0. 10	3. 5–5 0	10–14	101–110
95–100	95–100	80–100	0–15	2. 0–6. 3	0. 06–0. 10	3. 5–5. 0	10–14	101–115
95–100	95–100	60–85	0–10	>6. 3	<0 06	3. 5–5 0	8–12	95–110
95–100	95–100	50–90	0–5	>6. 3	<0. 06	5. 0–8. 0	9–15	91–110
95–100	95–100	90–100	30–90	0. 63–2. 0	0. 18–0. 22	4. 0–5. 0	9–15	101–120
95–100	95–100	90–100	40–60	0. 20–0. 63	0. 14–0. 20	4. 0–5. 0	10–17	105–115
95–100	95–100	90–100	60–100	<0 20	0. 14–0. 20	4. 0–5. 0	16–24	101–110
95–100	95–100	80–100	0–5	>6 3	<0. 06	4 0–5 0	8–12	101–115
95–100	95–100	60–85	5–15	>6. 3	0. 06–0. 10	4. 0–5. 0	8–14	111–120
95–100	95–100	75–90	0–10	>6. 3	<0. 06	4. 0–5. 0	8–14	105–125
95–100	95–100	60–85	5–15	>6. 3	0. 06–0. 10	4. 0–5. 0	8–14	111–120
95–100	95–100	75–95	0–10	>6. 3	<0. 06	4. 0–5 0	8–14	105–125
95–100	95–100	75–90	20–55	2. 0–6. 3	0. 14–0. 24	4. 0–5. 0	12–24	115–130
95–100	95–100	70–95	25–60	0. 63–6. 3	0. 12–0. 18	4. 0–5. 0	11–18	105–125
95–100	95–100	70–100	30–65	0. 63–2. 0	0 10–0. 18	4. 0–5 0	10–14	111–130
95–100	95–100	50–100	10–35	2 0–6. 3	0. 06–0. 12	4. 0–5. 0	8–18	105–125
95–100	95–100	85–100	55–90	2. 0–6. 3	0. 18–0. 27	4. 0–5 0	25–40	71–100
95–100	95–100	60–90	30–60	2. 0–6. 3	0. 12–0. 18	3. 5–5. 0	12–18	101–115
95–100	90–100	40–90	5–65	>2 0	0. 06–0. 24	3. 5–5 0	8–24	101–130
95–100	95–100	75–95	25–50	2 0–6. 3	0. 12–0. 18	4. 5–5 5	8–12	115–130
95–100	95–100	75–95	30–60	0. 63–2. 0	0. 18–0. 24	4 5–5. 5	12–18	111–125
95–100	95–100	50–85	5–25	2 0–6. 3	0. 06–0. 12	4. 0–5. 0	8–12	105–120
95–100	95–100	50–85	10–25	2. 0–6. 3	0. 06–0. 12	4 0–5. 0	8–14	115–130
95–100	95–100	65–90	15–40	2. 0–6 3	0. 12–0. 18	4. 0–5 0	8–14	115–130
95–100	95–100	50–85	10–25	>2. 0	0. 06–0. 12	4 0–5. 0	8–12	115–130
95–100	95–100	70–90	30–70	0. 63–2. 0	0. 12–0. 18	4 0–5. 0	8–14	120–130
95–100	95–100	90–100	80–100	<0. 20	0 18–0. 24	4. 0–5 0	14–24	101–110
95–100	95–100	70–95	5–20	>2. 0	0. 06–0. 10	4. 0–5. 0	10–14	101–110
95–100	95–100	50–90	10–25	>6. 3	0 06–0. 10	4. 0–5 0	8–14	111–120
95–100	90–100	50–90	5–25	>6 3	0. 06–0. 10	4. 0–5. 0	8–14	115–125
95–100	95–100	70–95	25–60	0. 63–6. 3	0. 12–0. 18	4. 0–5 0	11–18	115–130
95–100	95–100	70–90	10–50	0. 63–6. 3	0. 08–0. 18	4 0–5. 0	8–12	111–125
95–100	95–100	70–90	40–80	0–20–2. 0	0. 10–0. 18	4 0–5 0	10–16	111–130
95–100	95–100	70–95	45–90	<0. 20	0. 10–0. 18	4. 0–5 0	12–20	101–120
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95–100	95–100	70–90	10–45	2. 0–6. 3	0. 06–0. 12	3. 5–4 5	8–12	95–110
95–100	95–100	60–100	0–95	>0. 20	0 06–0. 18	3 5–4 5	8–18	101–120
95–100	95–100	60–90	10–25	>6. 3	0. 06–0 10	4. 0–5 0	8–12	115–125
95–100	95–100	60–90	5–25	>6. 3	<0. 06	4. 0–5. 0	8–12	115–130
95–100	95–100	40–85	0–20	>6. 3	<0. 06	4. 0–5 0	8–12	101–120
95–100	95–100	80–100	20–50	0. 63–2. 0	0. 18–0. 24	4. 0–5 0	15–25	95–105
95–100	95–100	80–95	20–40	0 63–2 0	0. 12–0. 18	4. 0–5. 0	8–12	115–130
95–100	95–100	75–90	5–35	2. 0–6. 3	<0. 06	4. 0–5. 0	8–12	105–130

TABLE 8.—*Estimated soil properties*

Soil series and map symbols	Depth to seasonal high water table	Depth from surface	Classification		
			USDA texture	Unified	AASHO
	Ft.	*In.*			
Portsmouth: Pt	0	0–14	Loam	SM, ML	A–4, A–5
		14–32	Clay loam, sandy clay loam, silty clay loam.	ML, CL	A–4, A–6
		32–44	Loamy sand or sand	SM, SP	A–2, A–3
Rumford: RuA, RuB, RuC	>5	0–18	Loamy sand	SM	A–2
		18–42	Sandy loam, sandy clay loam	SM, SC	A–2, A–4
		42–52	Coarse sand to sandy loam (locally fine gravelly).	SM, SP	A–2, A–3, A–4
Rutlege: Ry	0	0–17	Loamy sand	SM, SP,–SM	A–2, A–3
		17–60	Loamy sand or sand	SM, SP	A–2, A–3
Sassafras: SaA, SaB, SaC2, SaD, SfA, SfB.	>5	0–14	Sandy loam or loam	SM, ML	A–2, A–4
		14–31	Sandy clay loam, loam, or sandy loam.	SM, SC, CL, ML	A–2, A–4, A–6
		31–50	Loamy sand or sandy loam (locally fine gravelly).	SM, SP–SM	A–2, A–4
Swamp: Sw. No valid estimates can be made.	0				
Tidal marsh: Tf, Tm. No valid estimates can be made.	0				
Woodstown: Wo, Ws	1½–2	0–14	Sandy loam or loam	SM, ML	A–2, A–4
		14–38	Sandy clay loam, loam, or sandy loam.	SM, SC, ML, CL	A–2, A–4, A–6
		38–48	Sandy loam or loamy sand	SM, SP–SM	A–2, A–4

[1] Classes of permeability are: <0.20, slow or very slow, 0.20–0.63, moderately slow; 0.63–2.0, moderate; 2.0–6.3, moderately rapid;

Two other important soil properties are not listed in table 8. One is shrink-swell potential, which is low for nearly all the soils of Sussex County. The only important exceptions are the subsoil of Keyport and Elkton soils and the lower part of the subsoil of Matawan soils, which have a moderate shrink-swell potential. Highly organic soils, such as Muck, tend to shrink and subside if drained.

The other property not listed in table 8 is corrosivity. Because of their natural acidity, soils of the county are highly corrosive to concrete or other materials that contain free lime. The soils also tend to corrode metals; corrosivity is based on their effect on untreated steel objects and articles. The well-drained to excessively drained Evesboro, Kalmia, Kenansville, Rumford, and Sassafras soils have only a low corrosive effect on untreated steel. The moderately well drained Keyport, Klej, Matawan, and Woodstown soils generally have a moderate corrosive effect on untreated steel. All the other soils of the county have a highly corrosive effect on untreated steel.

Plastic properties of soils are not given as such in table 8. Plasticity significant in engineering is indicated by the letter "H" in the Unified classification symbol (MH, CH, or OH). This applies only to certain horizons of soils of the Elkton, Johnston, and Keyport series and to Muck.

Depth to bedrock is not shown in table 8. All the soils in the county are underlain by unconsolidated sediments of great thickness, and bedrock is not significant in engineering.

Engineering interpretations

Table 9 contains information useful to engineers and others who plan the use of soil material in construction of roads and highways, pipelines, and various farm facilities. It also gives the relative suitability of each soil for use as a source of topsoil, sand and gravel, and road fill and lists major limitations for winter grading.

Detrimental or undesirable features are emphasized in this table, but important desirable features are also listed. The ratings and other interpretations are based on the estimates of engineering properties given in table 8; on available test data, including those in table 10; and on field experience.

Topsoil, commonly used only for lawns and landscaping, refers to the surface layer, which is about 10 inches thick unless otherwise noted in the table. The subsoil is generally unsuitable for use as topsoil and is not rated.

The ratings for sand and gravel indicate only the probable presence of deposits, not the quality or quantity of the material.

The ratings for road fill, which is material used to build road subgrades and embankments, indicate the general performance of soil material removed from borrow pits for this purpose.

Pipelines and highway locations are influenced by soil features that affect construction and maintenance. In Sussex County the principal features are the depth to the water table and the stability of the soil material,

significant in engineering—Continued

Percentage passing sieve—				Permeability [1]	Available moisture capacity	Reaction (unlimed)	Moisture-density data	
No 4 (4.7 mm.)	No 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0 074 mm.)				Optimum moisture	Maximum dry density
				In /hr	*In /in of soil*	*pH*	*Pct*	*Lb /cu ft*
95–100	95–100	80–100	40–70	0. 63–2 0	0. 12–0. 20	4. 0–5. 0	20–30	80–95
95–100	95–100	80–100	51–75	0. 63–2. 0	0 14–0. 18	4 0–5. 0	8–14	115–125
95–100	95–100	75–100	5–25	>2. 0	0. 06–0 10	4 0–5. 0	8–14	110–125
95–100	95–100	55–80	15–30	>6. 3	0. 06–0 10	4. 0–5. 0	8–12	110–125
95–100	95–100	60–85	25–40	>6. 3	0 12–0. 18	4. 0–5 0	8–12	110–130
90–100	85–100	50–80	5–40	>6. 3	0 06–0. 12	4. 0–5 0	8–12	110–130
95–100	95–100	90–100	5–30	>6 3	0. 06–0. 10	4. 0–5. 0	10–14	110–120
95–100	95–100	90–100	5–20	>6 3	<. 06	4. 0–5. 0	8–12	110–120
95–100	95–100	60–85	30–65	2 0–6 3	0. 12–0. 24	4. 0–5. 5	8–12	115–125
95–100	90–100	50–90	30–70	0. 63–2. 0	0. 12–0. 24	4. 0–5. 0	8–14	115–130
80–100	70–100	50–80	10–40	2. 0–6. 3	0. 06–0. 10	4 0–5 0	9–15	110–125
95–100	95–100	75–95	30–65	0. 63–2. 0	0. 12–0. 24	4 0–5. 0	8–12	110–120
95–100	95–100	75–100	20–70	0. 63–2 0	0 12–0 24	4. 0–5. 0	8–14	115–130
90–100	85–100	40–70	10–40	2 0–6. 3	0 06–0. 12	4. 0–5 0	8–14	110–125

>6.3, rapid or very rapid.

particularly in trenches and when wet. The probable severity of frost action is also important, particularly for highway location and construction.

Sites for impounded ponds and reservoirs are affected mainly by the probable loss of water through seepage. Dug-out ponds are more dependent on depth to the water table than on runoff (see section "Wildlife").

The most important features of soil materials used for dams or other embankments are stability, porosity, plastic properties, and ease of compaction. In general, any moderately to slowly permeable material that has good strength and stability when compacted can be used in the comstruction of embankments for dams. Dikes and levees, which are low embankments used to impound or divert water, are not listed separately in table 9, but the soil features that affect use for embankments also affect these structures. Dikes and levees commonly do not require as great strength and stability as do dams for ponds and reservoirs.

The most important soil feature that affects drainage systems in Sussex County is permeability. The more permeable the soil, the more easily it is drained, if outlets for the drainage system are adequate. Permeability is explained in the Glossary.

Sprinklers are the only method of irrigation commonly used in Sussex County; other types of irrigation are mostly experimental. The most important soil features that affect sprinkler irrigation are available moisture capacity, rate of infiltration of water into the soil, and degree of natural drainage. Soils that are not naturally well drained to excessively drained should not be extensively irrigated unless adequate artificial drainage systems are installed and well maintained.

Grassed waterways are used to dispose of excess water. In Sussex County they are used particularly in areas where surface water is concentrated, most commonly by road grades and other structures. In such situations the moisture capacity of the soil and its fertility (natural or, more commonly, under a good fertilization program) are the most important characteristics to consider in establishing and maintaining good sod that successfully resists the erosive action of water.

Much grading, particularly for road and highway construction, is done in winter. Winter grading is affected chiefly by the depth of the water table, natural drainage condition, plastic properties of the soil, and trafficability of the soil when wet, as it commonly is in winter. These properties are listed in table 9.

Engineering test data

Table 10 presents the results of tests made to determine properties significant in soil engineering. The tests were made on samples from 14 soil profiles, representing 13 soil series in the county. Tests from elsewhere were also important in making engineering interpretations but are not included in this survey.

The liquid limit is the moisture content at which the soil material passes from a plastic to a liquid state. The

TABLE 9.—*Interpretations of*

Soil series and map symbols	Suitability as source of—			Soil features affecting—
	Topsoil	Sand and gravel	Road fill	Pipeline and highway location, construction, and maintenance
Berryland: Bd	Poor [2] sandy	Good for sand. Unsuitable for gravel.	Good if soil binder is added.	Water table seasonally at surface; wet excavations unstable; severe frost action.
Borrow pits. Bo. No interpretations. Material too variable.				
Coastal beach and dune land: Co.	Unsuitable: sand	Fair to good for sand. Unsuitable for gravel: sand.	Fair if soil binder is added.	Saline water table at depth of 1 to more than 10 feet; poor stability; wind and wave action.
Elkton: El, Em	Fair to depth of 10 inches: wetness.	Unsuitable: no sand or gravel	Poor: plastic subsoil.	Water table seasonally at depth of 0 to 1 foot; plastic subsoil; severe frost action.
Evesboro. EoB, EoD, EsD, EvA, EvB.	Poor to fair: sandy.	Fair to good for sand. Unsuitable for gravel.	Good if soil binder is added.	Loose; fair stability; droughty and difficult to vegetate.
Fallsington: Fa, Fs	Fair to depth of 10 inches. wetness.	Poor to fair for sand: contains fines. Unsuitable for gravel: insufficent quantity.	Fair to good	Water table seasonally at depth of 0 to 1 foot; wet excavations unstable at depth of more than 4 feet; severe frost action.
Fill land: Ft. No interpretations. Material too variable.				
Johnston: Jo	Fair [2] wetness	Unsuitable. generally not available.	Unsuitable: wetness.	Water table seasonally at surface; wet excavations unstable; flood hazard; severe frost action.
Kalmia· Ka	Good to depth of 18 inches.	Fair for sand below depth of 3 feet. contains fines. Unsuitable for gravel: generally not available.	Good	Good stability; moderate frost action.
Kenansville: KbA, KbB	Fair: sandy	Fair for sand below depth of 3 feet. excessive fines. Unsuitable for gravel: generally not available.	Fair· good if soil binder is added.	Fair to good stability; features generally favorable.
Keyport: KfA, KfB2	Fair in thin surface layer.	Unsuitable: no gravel	Poor. plastic subsoil.	Water table seasonally at depth of 1½ to 2 feet; plastic subsoil; severe frost action.
Klej: Kl	Poor: sandy	Fair to good for sand. Unsuitable for gravel. generally not available.	Fair; good if soil binder is added.	Water table seasonally at depth of 2 feet; wet excavations unstable; moderate frost action.

See footnotes at end of table

engineering properties

Soil features affecting—Continued						
Farm ponds, impounded [1]		Agricultural drainage	Sprinkler irrigation	Grassed waterways	Winter grading
Reservoirs	Embankments				
Excessive seepage; high water table.	Fair to poor stability, porous.	Moderately rapid permeability; very poor drainage; ditches unstable.	Very low available moisture capacity, moderately rapid infiltration; very poor drainage.	Very low available moisture capacity; very low fertility.	High water table; very poor drainage; very poor trafficability.
Excessive seepage	Poor stability; highly porous.	Not needed; excessive natural drainage.	Extremely low available moisture capacity; very rapid infiltration.	Extremely low available moisture capacity and fertility.	Features generally favorable.
Low to very low seepage; high water table.	Poor stability; plastic.	Slow permeability; poor drainage.	High available moisture capacity, slow infiltration; poor drainage.	High available moisture capacity; low fertility.	High water table; poor drainage; plastic.
High to excessive seepage.	Fair stability; porous.	Not needed; excessive natural drainage.	Low to very low available moisture capacity; rapid infiltration.	Low to very low available moisture capacity and fertility.	Fair to poor trafficability.
Moderate seepage in subsoil; high seepage in substratum; high water table.	Fair to good stability; good compaction characteristics.	Moderate permeability; poor drainage.	Moderate to high available moisture capacity; moderate infiltration; poor drainage.	Moderate to high available moisture capacity; low fertility.	High water table; poor drainage.
Moderate to high seepage; constant source of water; high water table.	Uppermost 20 inches unsuitable; substratum very porous.	Moderately rapid permeability, very poor drainage; flood hazard.	High available moisture capacity; moderately rapid infiltration, very poor drainage.	High available moisture capacity; low fertility.	High water table; very poor drainage; very poor trafficability; flood hazard.
Moderate seepage in subsoil; high seepage in substratum.	Good stability; good compaction characteristics.	Not needed; good drainage.	Moderate available moisture capacity; moderately rapid infiltration.	Moderate available moisture capacity and fertility.	Features generally favorable.
Moderately high seepage in subsoil, high seepage in substratum.	Fair to good stability, good compaction characteristics, substratum porous.	Not needed; good drainage.	Low to moderate available moisture capacity; moderately rapid infiltration.	Low to moderate available moisture capacity; low fertility.	Features generally favorable.
Low to very low seepage; moderately high water table.	Poor to fair stability; plastic.	Slow permeability; moderately good drainage.	High available moisture capacity; slow infiltration, moderately good drainage.	High available moisture capacity, low fertility.	Moderately high water table; moderately good drainage, plastic.
High seepage	Fair stability; porous.	Rapid permeability; moderately good drainage; ditches unstable.	Low available moisture capacity; rapid infiltration; moderately good drainage.	Low available moisture capacity and fertility.	Moderately high water table; moderately good drainage; poor trafficability.

TABLE 9.—*Interpretations of*

Soil series and map symbols	Suitability as source of— Topsoil	Sand and gravel	Road fill	Soil features affecting— Pipeline and highway location, construction, and maintenance
Matawan: Mm, Mn	Fair for sandy loam; poor for loamy sand.	Unsuitable to locally fair for sand. Unsuitable for gravel: generally not available.	Fair: good if soil is thoroughly mixed.	Water table seasonally at depth of 2 feet; severe frost action.
Muck, shallow: Mu	Fair [2] wetness	Unsuitable: no sand or gravel	Unsuitable: organic material; wetness.	Water table seasonally at surface; no stability or trafficability when wet; severe frost action.
Osier: Os	Poor: sandy; wetness.	Fair for sand: wetness. Unsuitable for gravel generally not available.	Fair if soil binder is added.	Water table seasonally at surface; wet excavations unstable; severe frost action.
Pocomoke: Pm	Fair: [2] wetness	Fair for sand below depth of 3 feet: wetness. Unsuitable for gravel. generally not available.	Fair if surface layer is discarded.	Water table seasonally at surface; wet excavations unstable; severe frost action.
Portsmouth: Pt	Fair: [2] wetness	Fair for sand below depth of 3 feet: excessive fines, wetness. Unsuitable for gravel: no gravel.	Fair if surface layer is discarded.	Water table seasonally at surface; wet excavations unstable; severe frost action.
Rumford: RuA, RuB, RuC	Fair: sandy	Fair for sand below depth of 3 feet; excessive fines. Locally fair for gravel.	Fair; good if soil binder is added.	Fair stability; features generally favorable.
Rutlege: Ry	Poor [2] sandy; wetness.	Fair for sand wetness. Unsuitable for gravel: generally not available.	Fair if soil binder is added.	Water table seasonally at surface, wet excavations unstable, severe frost action.
Sassafras: SaA, SaB, SaC2, SaD, SfA, SfB	Good to depth of 12 inches.	Fair for sand. excessive fines. Locally fair for gravel below depth of 3 feet.	Good	Good stability, moderate frost action.
Swamp: Sw	Unsuitable: ponded.	Unsuitable: ponded	Unsuitable: ponded.	Water table seasonally at surface, no stability or trafficability; severe frost action.
Tidal marsh: Tf, Tm	Unsuitable: tidal flooding.	Unsuitable tidal flooding	Unsuitable: tidal flooding.	Tidal flooding; extremely poor stability and trafficability; severe frost action.
Woodstown: Wo, Ws	Good to depth of 12 inches.	Fair for sand at depth below 3 feet Unsuitable for gravel. generally not available.	Good	Water table seasonally at depth of 1½ to 2 feet; good stability; severe frost action.

[1] Suitability for excavated or dug-out ponds is described in table 7 in the section "Wildlife."

engineering properties—Continued

Soil features affecting—Continued						
Farm ponds, impounded [1]		Agricultural drainage	Sprinkler irrigation	Grassed waterways	Winter grading
Reservoirs	Embankments				
Moderately high seepage, low seepage in lower part of subsoil.	Surface layer porous, lower part of subsoil plastic, good if throughly mixed.	Slow permeability; moderately good drainage.	Moderate available moisture capacity, moderate to moderately rapid infiltration, moderately good drainage.	Moderate available moisture capacity, low to moderate fertility.	Moderately high water table; moderately good drainage, fair trafficability.
Moderately high seepage, locally low seepage in substratum.	Highly organic; no stability when wet.	Moderately rapid permeability; very poor drainage; ditches unstable.	High available moisture capacity, moderately rapid infiltration; very poor drainage.	High available moisture capacity, low fertility.	High water table; very poor drainage, no trafficability when wet.
High seepage	Poor to fair stability; porous.	Rapid permeability; poor drainage, ditches unstable.	Low available moisture capacity, rapid infiltration; poor drainage.	Low available moisture capacity and fertility.	High water table; poor drainage, poor trafficability.
Moderate seepage; high seepage in substratum.	Fair stability; good compaction characteristics; substratum porous	Moderate permeability, very poor drainage.	Moderate to high available moisture capacity; moderate infiltration; very poor drainage.	Moderate to high available moisture capacity; low fertility.	High water table; very poor drainage; poor trafficability.
Moderate seepage; high seepage in substratum; high water table.	Fair stability; good compaction characteristics; substratum porous.	Moderate permeability; very poor drainage.	High available moisture capacity, moderate infiltration, very poor drainage.	High available moisture capacity; low fertility.	High water table; very poor drainage; poor trafficability.
High seepage	Fair stability; good compaction characteristics; substratum porous.	Not needed; somewhat excessively drained	Moderate available moisture capacity, rapid infiltration.	Moderate available moisture capacity, low fertility.	Features generally favorable.
High seepage; high water table.	Poor stability, porous	Rapid permeability, very poor drainage; ditches unstable.	Low available moisture capacity; rapid infiltration; very poor drainage.	Low available moisture capacity and fertility.	High water table, very poor drainage and trafficability.
Moderate seepage; high seepage in substratum.	Good stability; good compaction characteristics, substratum porous.	Not needed, good drainage.	High available moisture capacity; moderately rapid infiltration.	High available moisture capacity; moderate fertility.	Features generally favorable.
Variable properties; mostly unsuitable.	Variable properties, mostly unsuitable.	Drainage generally not feasible or economical.	Not applicable	Not applicable	High water table, extremely poor drainage, no trafficability.
Not applicable	Extremely poor stability; otherwise variable.	Not feasible	Not applicable	Not applicable	High water table; tidal flooding; no trafficability.
Moderate seepage; high seepage in substratum; moderately high water table.	Good stability, good compaction characteristics, substratum porous.	Moderate permeability, moderately good drainage	High available moisture capacity; moderate infiltration, moderately good drainage.	High available moisture capacity, low to moderate fertility.	Moderately high water table; moderately good drainage

[2] A surface layer that is high in organic-matter content may be more desirable for topsoil than indicated.

TABLE 10.—*Engineering*

[Tests performed by Delaware State Highway Department, in accordance with standard

Soil name and location	Report number	Depth	Moisture-density data [1]	
			Maximum dry density	Optimum moisture
		In.	*Lb/cu. ft.*	*Pct.*
Elkton sandy loam:				
Northeast of Delmar, east of Route 68, between Routes 454A and 454B (Modal).	6399	0–6	119	12
	6398	12–26	113	15
	6397	26–38	101	19
Evesboro loamy sand:				
Half a mile south of Laurel, on south side of Route 499 (Modal).	3530	0–9	115	9
	3531	9–31	121	8
	3532	31–43	106	14
Fallsington sandy loam:				
East of Delmar, east of Route 68, three-fourths of a mile north of Route 419 (Modal).	6402	0–8	121	11
	6400	12–23	120	12
	6401	23–33	120	12
Kalmia sandy loam:				
Grounds of experimental substation, University of Delaware, north of Route 28 (Modal).	4308	0–9	123	10
	4309	9–18	127	9
	4310	18–30	119	12
Kenansville loamy sand:				
Southwest edge of Laurel, south of cemetery and east of Route 499 (Modal).	3527	0–8	115	10
	3528	8–16	125	9
	3529	22–30	130	8
Klej loamy sand:				
North of Millville, east side of Route 493, half a mile north of Route 349 (Modal).	4212	0–10	116	13
	4213	16–26	119	10
	4214	26–36	124	9
Matawan loamy sand				
Southwest of Laurel, east side of Route 493, half a mile north of Route 24 (Modal).	6396	0–9	122	9
	6395	9–17	128	8
	6394	21–35	116	14
Matawan sandy loam:				
East side of Route 249, near junction with Route 253 (Modal).	3422	2–12	120	10
	3523	12–23	121	12
	3424	23–37	111	16
	3524	37–42	122	12
Osier loamy sand:				
Southwest of Laurel, on south side of Route 494 across from Laurel airport (Modal).	4208	0–8	123	10
	4209	8–23	127	10
	4210	23–30	120	9
Pocomoke sandy loam:				
1 mile west of Hardscrabble, three-fourths of a mile southwest of junction of Route 20 and 28 (Modal).	3525	0–10	98	20
	3423	10–17	123	10
	3526	17–31	130	9
Portsmouth loam				
Northeast part of experiment substation, University of Delaware, southwest of Georgetown (Modal).	4304	0–8	85	27
	4305	14–32	117	13
	4301	32–44	117	13
Rumford loamy sand:				
End of Route 236, about 5 miles northeast of Milton (Modal).	6787	0–9	122	10
	6788	18–28	126	10
	7060	28–42	128	9

See footnotes at end of table.

test data

procedures of the American Association of State Highway Officials (AASHO)]

Mechanical analysis [2]									Liquid limit	Plasticity index	Classification	
Percent passing sieve—					Percentage smaller than—						AASHO [3]	Unified
⅜ inch	No. 4 (4.7 mm.)	No. 10 (2.0 mm.)	No. 40 (0.42 mm.)	No. 200 (0.074 mm.)	0.05 mm.	0.02 mm.	0.005 mm.	0.002 mm.				
									Pct			
100	99	99	92	37	31	25	14	11	16	[4] NP	A-4	SM
--------	100	99	94	50	45	39	33	31	31	15	A-6	SC
--------	--------	100	97	81	76	68	55	52	50	30	A-7-5	CL-CH
--------	--------	100	79	11	9	7	5	3	NP	NP	A-2-4	SP-SM
--------	--------	100	81	16	14	11	6	5	NP	NP	A-2-4	SM
--------	--------	100	79	4	3	3	3	3	NP	NP	A-3	SP
--------	--------	100	89	29	26	25	18	16	NP	NP	A-2-4	SM
--------	--------	100	93	40	38	35	25	22	24	9	A-4	SC
--------	--------	100	87	30	25	21	19	17	24	8	A-2-4	SC
100	99	99	79	25	23	19	11	10	14	NP	A-2-4	SM
100	99	98	83	27	24	21	13	12	--------	NP	A-2-4	SM
100	99	99	85	32	29	27	20	19	24	8	A-2-4	SC
100	99	99	78	8	8	7	2	2	--------	NP	A-2-4	SP-SM
--------	--------	100	80	21	19	15	9	7	--------	NP	A-2-4	SM
--------	--------	100	79	27	24	19	13	13	14	NP	A-2-4	SM
--------	100	99	79	21	20	16	8	7	--------	NP	A-2-4	SM
[5] 99	99	98	78	19	18	14	9	8	--------	NP	A-2-4	SM
[5] 99	99	98	71	14	13	11	8	7	--------	NP	A-2-4	SM
[5] 99	99	98	78	25	20	14	7	5	--------	NP	A-2-4	SM
[5] 99	99	98	79	32	31	24	12	11	--------	NP	A-2-4	SM
[5] 99	99	98	86	49	46	41	33	31	30	15	A-6	SC
--------	100	99	90	46	34	28	17	13	20	NP	A-4	SM
100	99	99	92	57	49	39	25	23	20	6	A-4	ML-CL
--------	100	99	95	81	57	49	39	37	34	15	A-6	CL
--------	100	99	75	37	26	22	19	18	24	NP	A-4	SM
--------	--------	100	82	22	18	14	7	6	14	NP	A-2-4	SM
--------	--------	100	82	21	19	15	9	9	--------	NP	A-2-4	SM
--------	--------	100	83	17	15	12	9	9	--------	NP	A-2-4	SM
--------	--------	100	87	42	37	28	12	9	35	NP	A-4	SM
--------	100	99	85	38	34	31	28	14	17	NP	A-4	SM
--------	--------	100	86	31	27	24	16	13	11	NP	A-2-4	SM
--------	100	99	94	62	56	37	21	17	41	NP	A-5	ML
--------	100	99	93	52	48	40	38	25	20	NP	A-4	ML
--------	--------	100	99	23	20	18	15	12	14	NP	A-2-4	SM
--------	100	99	74	21	18	12	7	6	16	NP	A-2-4	SM
--------	--------	100	78	25	24	18	14	13	23	11	A-2-6	SC
--------	100	99	78	29	27	17	13	13	22	7	A-2-4	SM

TABLE 10.—*Engineering*

Soil name and location	Report number	Depth	Moisture-density data [1]	
			Maximum dry density	Optimum moisture
		In.	*Lb./cu. ft.*	*Pct.*
Rutlege loamy sand:				
Northeast part of experiment substation, University of Delaware, southwest of Georgetown (Modal).	4306	0–9	112	14
	4307	17–34	112	12
Woodstown sandy loam				
North of Hardscrabble, on east side of Route 473 (Modal).	6391	0–10	119	11
	6392	14–23	118	13
	6393	23–38	119	13

[1] Based on AASHO Designation T 99–57 (*2*).
[2] Mechanical analyses according to AASHO Designation T 88–57 (*2*). Results by this procedure may differ somewhat from results obtained by the soil survey procedure of the Soil Conservation Service (SCS). In the AASHO procedure, the fine material is determined by the hydrometer method, and the various grain-size fractions are calculated on the basis of all of the material, up to and including material 3 inches in diameter. In the SCS procedure, the fine material is determined by the pipette method, and the materiol coarser than 2 milli-

plastic limit (not given in table 10) is the moisture content at which the soil material changes from a semisolid to a plastic state. The plasticity index is the numerical difference between the liquid limit and the plastic limit, and thus is the moisture range over which the soil exists in a plastic state. It should be noted that many soils of the county, commonly the more sandy ones, are not in a plastic state at any moisture content.

Table 10 also gives the density of the soil when compacted by standard methods at the optimum moisture content. If the soil is compacted at either a lower or higher moisture content, the density obtained, in pounds of dry soil per cubic foot, is less than indicated in the table. The figures given in the table are especially important in planning construction with or on compacted soil, because the greater the density or degree of compaction obtained for the soil, the greater the loads or stresses the soil can support or resist without settlement or distortion.

The data in table 10 are also the basis for the engineering classification of the soils.

Town and Country Planning

Except for the Atlantic coast from Cape Henlopen to the Maryland State line, Sussex County is still largely a rural area. Nevertheless, the population is growing and nonfarm use of the land is expanding. In recent years there has been a rapid increase in residential and commercial use of the land, especially along some highways, and a large increase in recreational use along the coast. Accompanying this change in use is a growing demand for reliable information about soil conditions that affect nonfarm uses. Generally, the soils well suited to farming are also the soils well suited to building and other nonfarm uses.

Among the soils that are well suited to farming without artificial drainage are the nearly level and gently sloping soils of the Kalmia, Kenansville, Rumford, and Sassafras series. Such soils make up a little less than 25 percent of the acreage in the county. Except for the 13 percent that is poorly suited or unsuited, the rest of the acreage is well suited to farming if it is adequately drained, irrigated, or protected, according to the needs of each soil.

The soils of the Evesboro, Kalmia, Kenansville, Rumford, and Sassafras series that have only a slight limitation for disposal of effluent from septic tanks make up almost half the county. It should be noted, however, that in the larger part of these areas there is a hazard of pollution from disposal fields to ground water, surface water, or both, because effluent liquid can move rapidly for considerable distances through the very sandy subsoil.

Some slowly permeable soils, or soils that have a high water table, have severe limitations for disposal of effluent from septic tanks but can be used for sewage lagoons. Only about 1 percent of the acreage has a slight limitation for sewage lagoons, but more than 40 percent has only a moderate limitation and can be used for sewage lagoons if careful planning, construction, and maintenance practices are followed.

About half the county has only a slight limitation for houses with basements, but nearly two-thirds of the county has only a slight limitation for houses without basements. Only those soils and land types that are poorly drained or very poorly drained or are excessively loose and sandy, such as Coastal beach and dune land, have a severe limitation for houses of any kind.

Only slightly more than 10 percent of the acreage consists of soils that have a slight limitation for sanitary landfills, but these are also the most desirable soils for farming and many other uses. Other areas can be used for sanitary landfills if careful planning, construction, and operation practices are used.

Kalmia and Sassafras soils that have slopes of less than 2 percent have only slight limitations for use as athletic fields and other nearly level intensive play areas. These soils occupy slightly less than 10 percent of the acreage. Many other soils of the county have a moderate limitation for this use because they are sandy, are seasonally wet, or have slopes of 2 to 5 percent (see table 12).

About 11 percent of the acreage has a slight limitation for parks and picnic areas. About 51 percent has a moderate limitation because of sandiness or seasonal wetness

test data—Continued

Mechanical analysis [2]									Liquid limit	Plasticity index	Classification	
Percent passing sieve—					Percentage smaller than—						AASHO [3]	Unified
⅜ inch	No 4 (4.7 mm)	No. 10 (2 0 mm)	No. 40 (0.42 mm)	No. 200 (0 074 mm.)	0 05 0 05	0 02 mm.	0.005 mm.	0.002 mm.				
									Pct			
----------	100	99	92	25	21	16	9	8	23	NP	A-2-4	SM
----------	100	99	99	15	15	12	7	6	--------	NP	A-2-4	SM
100	99	99	92	41	37	33	17	14	18	NP	A-4	SM
100	99	99	94	55	49	39	29	27	28	14	A-6	CL
100	99	99	95	52	50	38	27	25	26	12	A-6	CL

meters in diameter is excluded from calculations of grain-size fractions. The mechanical analysis data reported in this table are not suitable for use in naming the textural class of a soil

[3] Based on AASHO Designation M 145-49 (*2*).

[4] Nonplastic.

[5] 100 percent passed the ¾-inch sieve.

and can be used for these purposes with only moderate inconvenience or with reasonable measures to improve them.

Artificial ponds and small lakes are desirable for recreational use and for esthetic value. Soils of the Berryland, Elkton, Fallsington, Osier, Pocomoke, Portsmouth, and Rutlege series are generally most suitable for excavated ponds. Soils of the Keyport, Klej, Matawan, and Woodstown series are generally better suited to impoundments than to other uses, but additional excavation usually improves them. Soils of the Evesboro, Kalmia, Kenansville, Rumford, and Sassafras series are generally suitable only for impoundments and not for excavated ponds. In impoundments, both the dam and the floor of the pond must consist of soil material that does not permit excessive seepage. Chemical treatment or other special treatment is commonly needed to seal the material and prevent excessive seepage.

An onsite investigation should be made before constructing a pond in any soil.

Residential and related uses of the soils

Table 11 gives the degree and kind of limitation of each soil in Sussex County for specified uses. This table can be used as a general guide by planning and zoning boards and those who develop areas for residential and other community uses.

The degree of limitation reflects the most significant single limitation, but more than one kind of limitation may be listed. For example, a soil may have a moderate limitation for a certain use because of both a moderately high water table and slope. A soil may have a moderate limitation for a certain use because of permeability, but a steeper soil of the same series may have a severe limitation because of slope alone.

A slight limitation means that the soil may be safely used for the specified purpose with only normal care in construction or installation and in maintenance. A moderate limitation means that the soil may be used for a specified purpose, but use will commonly be accompanied by some difficulties that can be prevented or overcome by relatively easy special planning, special treatment, or both.

A severe limitation for a particular use does not mean that the soil cannot be put to that use. For example, a soil that has a high water table is considered severely limited for streets and parking lots, but it can be used for streets and parking lots if drainage is improved and the water table is lowered. Also, a soil that has a slowly permeable subsoil is considered severely limited for disposal of effluent from septic tanks, but some special means of effluent disposal may be utilized if the expense is justified.

If a very severe limitation is listed in table 11, it means that the soil or land type is entirely unsuitable for that use without intensive and expensive major reclamation or other measures that are not economically or otherwise feasible. For example, Tidal marsh is considered very severely limited for all uses listed in table 11, because tidal flooding completely precludes these uses from the marshes in their natural state.

Following are the soil properties that affect the uses specified in table 11.

Disposal fields for septic-tank systems.—Permeability, depth to seasonal high water table, natural drainage, slope, and hazard of flooding or ponding.

Sites for sewage lagoons.—Permeability, slope, and hazard of flooding or ponding.

Foundations for houses of three stories or less, without basements.—Depth to water table, natural drainage, stability of the soil, slope, and hazard of flooding or ponding. For larger or heavier buildings, a special investigation should be made at each site.

Foundations for houses with basements.—Depth to water table, natural drainage, stability of the subsoil (especially when wet), slope, and hazard of flooding or ponding.

Streets and parking lots.—Depth to water table, stability, slope, and hazard of flooding or ponding.

Sites for sanitary land fills.—Permeability, depth to water table, natural drainage, slope, hazard of flooding or ponding, and plastic properties. For trench-type

TABLE 11.—*Limitations of soils for*

Soil series and map symbols	Degree and kind of limitation for—			
	Disposal fields for septic-tank systems	Sewage lagoons [1]	Foundations for houses of three stories or less— Without basements	Foundations for houses of three stories or less— With basements
Berryland: Bd	Severe high water table.[3]	Severe: rapid permeability.[3]	Severe: high water table.	Severe. high water table.
Borrow pits: Bo. No interpretations. Material too variable.				
Coastal beach and dune land: Co.	Severe: fluctuating water table; tidal flooding.[3]	Very severe: rapid permeability; tidal flooding.[3]	Severe: fluctuating water table; tidal flooding; poor stability; storm hazard.	Severe· fluctuating water table; tidal flooding; poor stability; storm hazard.
Elkton: El, Em	Severe· high water table; slow permeability.	Slight	Severe: high water table.	Severe: high water table.
Evesboro:				
EoB	Slight [3]	Severe: rapid permeability.[3]	Slight	Slight
EoD, EsD	Moderate: 5 to 15 percent slope.[3]	Severe. rapid permeability; 5 to 15 percent slope.[3]	Moderate: 5 to 15 percent slope.	Moderate: 5 to 15 percent slope.
EvA	Slight [3]	Severe: rapid permeability.[3]	Slight	Slight
EvB	Slight [3]	Severe: rapid permeability.[3]	Slight	Slight
Fallsington: Fa, Fs	Severe: high water table.	Moderate: moderate permeability.	Severe: high water table.	Severe: high water table.
Fill land: Ft. No interpretations. Material too variable.				
Johnston: Jo	Severe: high water table; flood hazard.[3]	Severe: flood hazard [3]	Severe: high water table; flood hazard.	Very severe: high water table; flood hazard.
Kalmia: Ka	Slight	Moderate: moderate permeability.	Slight	Slight
Kenansville:				
KbA	Slight [3]	Severe: rapid permeability.[3]	Slight	Slight
KbB	Slight [3]	Severe: rapid permeability.[3]	Slight	Slight
Keyport:				
KfA	Severe: slow permeability; moderately high water table.	Slight	Slight	Moderate: moderately high water table.
KfB2	Severe: slow permeability; moderately high water table.	Moderate: 2 to 5 percent slope.	Slight	Moderate: moderately high water table.

See footnotes at end of table.

residential and related uses

Degree and kind of limitation for—Continued			
Streets and parking lots	Sites for sanitary landfills		Home gardens and landscaping [2]
	Trench method	Area method	
Severe: high water table	Very severe: high water table, very poor drainage.[3]	Severe: high water table; very poor trafficability when wet.[3]	Severe: high water table; very low available moisture capacity and fertility; very poor natural drainage.
Severe: fluctuating water table, tidal flooding, poor stability.	Very severe: rapid permeability; tidal flooding.[3]	Very severe: rapid permeability; tidal flooding [3]	Very severe: very low available moisture capacity and fertility, salinity; cutting by windblown sand.
Severe: high water table	Very severe: high water table; poor drainage, plastic subsoil.	Severe: high water table; poor drainage; plastic subsoil.	Severe: poor natural drainage.
Slight to moderate: 0 to 5 percent slope.	Severe: loose; caving; rapid permeability.[3]	Severe: rapid permeability [3]	Severe. very low moisture capacity and fertility.
Severe: 5 to 15 percent slope.	Severe: loose; caving; rapid permeability.[3]	Severe: rapid permeability [3]	Severe low to very low moisture capacity and fertility; 5 to 15 percent slope.
Slight	Severe. rapid permeability [3]	Severe: rapid permeability [3]	Severe: low moisture capacity and fertility.
Moderate: 2 to 5 percent slopes.	Severe. rapid permeability [3]	Severe: rapid permeability [3]	Severe: low moisture capacity and fertility.
Severe: high water table	Very severe: high water table	Severe: high water table	Severe: high water table; poor natural drainage.
Severe: high water table; flood hazard.	Very severe: high water table; flood hazard.[3]	Very severe: high water table; flood hazard.[3]	Severe: high water table; very poor natural drainage; flood hazard.
Slight	Slight	Slight	Slight.
Slight	Severe: rapid permeability [3]	Severe: rapid permeability [3]	Moderate. low to moderate moisture capacity; low fertility.
Moderate: 2 to 5 percent slope.	Severe: rapid permeability [3]	Severe: rapid permeability	Moderate: low to moderate moisture capacity; low fertility; 2 to 5 percent slope.
Moderate: moderately high water table.	Severe: moderately high water table.	Moderate: moderately high water table.	Moderate: moderately high water table, moderately good drainage.
Moderate. moderately high water table; 2 to 5 percent slope.	Severe: moderately high water table.	Moderate: moderately high water table.	Severe: moderately high water table, moderately good drainage; 2 to 5 percent slope; eroded.

TABLE 11.—*Limitations of soils for*

Soil series and map symbols	Degree and kind of limitation for—			
	Disposal fields for septic-tank systems	Sewage lagoons [1]	Foundations for houses of three stories or less—	
			Without basements	With basements
Klej: Kl	Moderate: moderately high water table.[3]	Severe: rapid permeability.[3]	Slight	Moderate: moderately high water table.
Matawan:				
Mm	Severe: slow permeability; moderately high water table.	Slight	Slight	Moderate: moderately high water table.
Mn	Severe: slow permeability, moderately high water table.	Slight	Slight	Moderate: moderately high water table.
Muck, shallow: Mu	Very severe: high water table, ponding.[3]	Very severe: organic material; ponding.[3]	Very severe: high water table; ponding; organic material, no stability when wet.	Very severe: high water table, ponding; no stability when wet.
Osier. Os	Severe: high water table.[3]	Severe: rapid permeability.[3]	Severe: high water table.	Severe: high water table; wet excavations unstable.
Pocomoke: Pm	Severe: high water table.	Moderate: moderate permeability.	Severe: high water table.	Severe: high water table.
Portsmouth: Pt	Severe high water table.	Moderate: moderate permeability.	Severe: high water table.	Severe: high water table.
Rumford:				
RuA	Slight [3]	Severe: rapid permeability.[3]	Slight	Slight
RuB	Slight [3]	Severe: rapid permeability.[3]	Slight	Slight
RuC	Slight [3]	Severe: rapid permeability; 5 to 10 percent slope.	Slight	Slight
Rutlege: Ry	Severe. high water table.[3]	Severe: rapid permeability.[3]	Severe: high water table.	Severe: high water table; wet excavations unstable.
Sassafras:				
SaA, SfA	Slight	Moderate: moderate permeability.	Slight	Slight
SaB, SfB	Slight	Moderate: moderate permeability; 2 to 5 percent slope.	Slight	Slight
SaC2	Slight	Severe: 5 to 10 percent slope.	Slight	Slight
SaD	Moderate 10 to 15 percent slope.	Severe: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.

See footnotes at end of table.

residential and related uses—Continued

Degree and kind of limitation for—Continued			
Streets and parking lots	Sites for sanitary landfills		Home gardens and landscaping [2]
	Trench method	Area method	
Moderate: moderately high water table.	Severe: rapid permeability [3]	Severe: rapid permeability, moderately high water table.[3]	Severe: low moisture capacity and fertility; moderately good drainage.
Moderate: moderately high water table.	Severe: moderately high water table.	Moderate: moderately high water table.	Moderate: moderate moisture capacity, low fertility, moderately high water table, moderately good drainage.
Moderate: moderately high water table.	Severe: moderately high water table.	Moderate: moderately high water table.	Moderate: moderate moisture capacity and fertility, moderately high water table; moderately good drainage.
Very severe: high water table, ponding, organic material; no stability when wet.	Very severe: high water table, ponding.[3]	Very severe: high water table; ponding.[3]	Severe: high water table, ponding; low fertility; very poor natural drainage.
Severe: high water table	Very severe: high water table, rapid permeability [3]	Severe: high water table, rapid permeability [3]	Severe: high water table, low moisture capacity and fertility, poor natural drainage.
Severe: high water table	Very severe: high water table	Severe: high water table	Severe: high water table; very poor natural drainage.
Severe: high water table	Very severe: high water table	Severe: high water table	Severe: high water table; very poor natural drainage.
Slight	Severe: rapid permeability [3]	Severe: rapid permeability [3]	Moderate: moderate moisture capacity, low fertility
Moderate: 2 to 5 percent slope	Severe: rapid permeability [3]	Severe: rapid permeability [3]	Moderate: moderate moisture capacity, low fertility; 2 to 5 percent slope
Severe: 5 to 10 percent slope	Severe: rapid permeability [3]	Severe: rapid permeability [3]	Severe: 5 to 10 percent slope
Severe: high water table	Very severe: high water table; rapid permeability [3]	Severe: high water table, rapid permeability [3]	Severe: high water table, low moisture capacity and fertility, very poor natural drainage.
Slight	Slight	Slight	Slight
Moderate: 2 to 5 percent slope	Slight	Slight	Moderate: 2 to 5 percent slope
Severe: 5 to 10 percent slope.	Slight	Slight	Severe: 5 to 10 percent slope, eroded
Severe: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.	Severe: 10 to 15 percent slope

TABLE 11.—*Limitations of soils for*

Soil series and map symbols	Degree and kind of limitation for—			
	Disposal fields for septic-tank systems	Sewage lagoons [1]	Foundations for houses of three stories or less—	
			Without basements	With basements
Swamp: Sw	Very severe ponding	Very severe: pon ding	Very severe ponding	Very severe· ponding
Tidal marsh Tf, Tm	Very severe. tidal flooding.	Very severe tidal flooding.	Very severe tidal flooding.	Very severe· tidal flooding.
Woodstown Wo, Ws	Moderate moderately high water table.	Moderate moderate permeability.	Slight	Moderate moderately high water table.

[1] It is assumed that any surface layer or other horizon that contains appreciable amounts of organic matter will be removed and that the floor of the lagoon will be constructed on the least permeable layer in the profile. If it is constructed on a more permeable layer, the limitation will be greater.

landfills deeper than 5 or 6 feet, onsite studies are needed of the underlying strata, the water table, and the hazards of aquifer and ground water pollution.

Home gardens and landscaping.—Available moisture capacity, natural fertility, depth to water table, natural drainage, texture of the surface layer, slope, degree of erosion, and hazard of flooding or ponding.

Recreational uses of the soils

Table 12 shows the degree and kind of limitation of each soil in the county for athletic fields and playgrounds, campsites for tents and trailers, parks and picnic areas, and paths and trails. Not listed in the table are developments that have recreational and esthetic values such as ponds (fig. 17).

The ratings in table 12 were based on natural drainage, depth to the water table, permeability, texture of the surface layer, slope, hazard of flooding or ponding, and trafficability.

No one property limits a soil for all recreational uses or necessarily to the same degree for different uses. A slope of 5 percent or more severely limits the use of a soil for an athletic field because so much land leveling is required. On the other hand, only slopes of more than 25 percent severely limit the use of a soil for paths and trails, and there are practically no such slopes in Sussex County.

The degrees of limitation are expressed as *slight, moderate*, and *severe* *Slight* indicates soil properties favorable for the rated use and only minor limitations that can be easily overcome *Moderate* indicates soil properties moderately favorable for the rated use and limitations that can be overcome or modified by special planning or maintenance. *Severe* indicates unfavorable soil properties that are difficult and costly to modify or overcome.

A severe limitation for some specified use does not mean that the soil cannot be put to that use. For example, a soil that is severely limited for athletic fields may be used for athletic fields if drainage is improved, the surface is leveled, or the site is otherwise altered as may be necessary. Such treatment usually entails expensive operations.

If a very severe limitation is listed in table 12, it means that the soil or land type is unsuitable for that use without intensive and expensive major reclamation or other measures that are not economically or otherwise feasible. For example, both Swamp and Tidal marsh are considered very severely limited for all uses listed in table 12 because ponding by fresh water or tidal flooding completely precludes these uses from the swamps and marshes in their natural state, which will not even support foot traffic.

Service buildings are needed with some recreational facilities. Such buildings generally are not large, and the limitations are approximately the same as those given in table 11 for houses.

Formation and Classification of the Soils

This section describes the major factors of soil formation and the processes of soil formation as they relate to Sussex County. It also explains the system of classifying soils into categories broader than the series.

Factors of Soil Formation

Soils form as a result of the interaction of five major factors. climate, plant and animal life, parent material, relief, and time. All five affect the formation of every soil, but the importance of each varies from place to place. In some cases one is more important and in some cases another, and in some cases the influence of each is about equal.

Climate

Sussex County has the temperate, rather humid climate that is typical of most coastal areas of the Middle Atlantic States. The climate is fairly uniform throughout the county, and no important differences among soils can be attributed to it. Some differences, however, occur in microclimate. For example, in a narrow band along Delaware Bay and the Atlantic Ocean, the humidity is higher than in other parts of the county. Consequently, plants lose less moisture through transpiration. In addition, the temperature changes more gradually along the bay and ocean, and the weather is warmer in winter and cooler in summer than it is farther inland.

residential and related uses—Continued

Degree and kind of limitation for—Continued			
Streets and parking lots	Sites for sanitary landfills		Home gardens and landscaping [2]
	Trench method	Area method	
Very severe. ponding	Very severe ponding	Very severe: ponding	Very severe. ponding.
Very severe: tidal flooding	Very severe tidal flooding	Very severe. tidal flooding	Very severe tidal flooding.
Moderate moderately high water table	Severe moderately high water table.	Moderate moderately high water table.	Moderate moderately high water table, moderately good drainage.

[2] Intensively managed small vegetable or flower gardens and plantings of shrubs or other ornamentals. The limitations listed also take into account minor landshaping or grading.
[3] Probability of polluting nearby wells, springs, ponds, streams, or other sources of water.

Precipitation exceeds evapotranspiration in Sussex County. For this reason, the soils have been leached of most of their soluble materials and are strongly acid and generally low in plant nutrients. Besides leaching soluble material, water percolating through a soil moves clay particles from the surface layer to a lower layer. The effects of leaching and translocation of clay have been fairly uniform throughout the county. Some deposits, however, are too recent to have been affected much, and many older deposits are very sandy and contain too little clay. Alternate wetting and drying and alternate freezing and thawing are responsible for the blocky structure of some clay-enriched soils.

Plant and animal life

In general, there is no evidence that any differences among the soils in this county result from differences in plant or animal life, but the original vegetation was a major influence in soil formation. The original vegetation, except on the coastal marshes and beaches, was a dense forest of hardwoods. Hardwoods use large amounts of calcium and other bases, if these are available, and return some to the soils each year when the leaves fall. The soils of the county were never high in bases; and except for this return through leaf fall, many would now be more acid than they are. Pines, which need fewer bases than hardwoods, have probably always been present but are common only in second-growth and cutover woodlands.

The activities of man have influenced soil formation and will continue to do so. Clearing and cultivating the soils, introducing new kinds of crops and other plants, and improving drainage have affected development of soils and will more strongly affect their development in the future. The most important changes brought about by man are the mixing of the upper horizons of the soil to form a plow layer; the tilling of sloping soils, which results locally in accelerated erosion and the deposition of debris in other areas, and liming and fertilizing, which change the reaction and the content of plant nutrients, especially in the upper horizons. The most obvious change made by man has been the replacement of the native vegetation.

Parent material

The parent material in which the soils of this county formed consisted entirely of sediments. Most were transported into the area by water, but some were probably transported by wind, and some by ice floes carried by glacial melt water. These sediments ranged in size from clay particles to pebbles and included a few small stones. They were deposited in a shallow sea and later emerged to form the Delmarva Peninsula, of which Sussex County is a part.

The texture of the present soils is directly related to the texture of the original parent material. Soils of the Berryland, Evesboro, Klej, Osier, and Rutlege series, for example, formed in coarse textured sediments that consisted chiefly of silica sand but contained very minor quantities of silt and clay. These soils occupy approximately one-third of the county. There is evidence that the parent material of some of these soils, especially that of the Evesboro soils, was reworked by wind, water, or both.

In about 56 percent of the county, the sediments that made up the parent material consisted mainly of sand but contained significant amounts of clay and some silt. These deposits were not uniform, and in places they were sandier in some layers than in others. Soils of the Fallsington, Kalmia, Kenansville, Matawan, Pocomoke, Portsmouth, Rumford, Sassafras, and Woodstown series formed in this kind of material. The major differences among these soils are those caused by differences either in natural drainage or in thickness of the deposits.

In small areas that make up only about 1 percent of the county, the sediments consisted chiefly of clay and silty clay. These finer textured sediments are not very thick. Soils of the Elkton and Keyport series formed in these relatively thin, clayey deposits.

Several kinds of sediments have been deposited more recently. Soils of the Johnston series formed in recent deposits of silty alluvium that contains a considerable amount of organic matter and is still being deposited on flood plains. Coastal beach and dune land are water-deposited and wave-worked sands; Muck is decayed plant remains in upland depressions; Tidal marsh is recent sediments that have been influenced by the action of

TABLE 12.—*Limitations of soils for recreational uses*

Soil series and map symbols	Athletic fields and playgrounds	Campsites for tents and trailers	Parks and picnic areas	Paths and trails
Berryland: Bd	Severe: very poor natural drainage; water table seasonally at surface.	Severe: very poor natural drainage; water table seasonally at surface.	Severe: very poor natural drainage; water table seasonally at surface.	Severe: very poor natural drainage; water table seasonally at surface.
Borrow pits: Bo. No interpretations. Material too variable.				
Coastal beach and dune land: Co	Severe: noncoherent sand; hazard of tidal flooding.	Severe: noncoherent sand; hazard of tidal flooding.	Severe: noncoherent sand; hazard of tidal flooding.	Severe: noncoherent sand; hazard of tidal flooding.
Elkton: El, Em	Severe: poor natural drainage; water table seasonally at depth of 0 to 1 foot.	Severe: poor natural drainage; water table seasonally at depth of 0 to 1 foot.	Severe: poor natural drainage; water table seasonally at depth of 0 to 1 foot.	Severe: poor natural drainage; water table seasonally at depth of 0 to 1 foot.
Evesboro:				
EoB	Severe: loose sand	Severe: loose sand	Severe: loose sand	Severe: loose sand.
EoD, EsD	Severe: loose sand or loamy sand; 5 to 15 percent slope.	Severe: loose sand or loamy sand.	Severe: loose sand or loamy sand.	Severe: loose sand or loamy sand.
EvA	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.
EvB	Moderate: loamy sand surface layer; 2 to 5 percent slope.	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.	Moderate: loamy sand surface layer.
Fallsington: Fa, Fs	Severe: poor natural drainage; water table seasonally at surface.	Severe: poor natural drainage; water table seasonally at surface.	Severe: poor natural drainage; water table seasonally at surface.	Severe: poor natural drainage; water table seasonally at surface.
Fill land: Ft. No interpretations. Material too variable.				
Johnston: Jo	Severe: very poor natural drainage; water table seasonally at surface; flooding	Severe: very poor natural drainage; water table seasonally at surface; flooding.	Severe: very poor natural drainage; water table seasonally at surface; flooding.	Severe: very poor natural drainage; water table seasonally at surface; flooding.
Kalmia: Ka	Slight	Slight	Slight	Slight.
Kenansville:				
KbA	Moderate: loamy sand surface.	Moderate: loamy sand surface.	Moderate: loamy sand surface.	Moderate: loamy sand surface.
KbB	Moderate: loamy sand surface; 2 to 5 percent slope.	Moderate: loamy sand surface.	Moderate: loamy sand surface.	Moderate: loamy sand surface.
Keyport: KfA, KfB2	Moderate: moderately good natural drainage; slow permeability; 0 to 5 percent slope.	Moderate: moderately good natural drainage; slow permeability.	Moderate: moderately good natural drainage	Slight.
Klej: Kl	Moderate: moderately good natural drainage; loamy sand surface.	Moderate: moderately good natural drainage; loamy sand surface.	Moderate: moderately good natural drainage; loamy sand surface.	Moderate: loamy sand surface.
Matawan:				
Mm	Moderate: moderately good natural drainage; slow permeability; loamy sand surface.	Moderate: moderately good natural drainage; slow permeability; loamy sand surface.	Moderate: moderately good natural drainage; loamy sand surface.	Moderate: loamy sand surface.
Mn	Moderate: moderately good natural drainage; slow permeability.	Moderate: moderately good natural drainage; slow permeability.	Moderate: moderately good natural drainage.	Slight.

TABLE 12.—*Limitations of soils for recreational uses*—Continued

Soil series and map symbols	Athletic fields and playgrounds	Campsites for tents and trailers	Parks and picnic areas	Paths and trails
Muck, shallow: Mu	Very severe: very poor natural drainage, organic materials, ponding.	Severe: very poor natural drainage, organic materials; ponding.	Severe: very poor natural drainage, organic materials, ponding.	Severe: very poor natural drainage, organic materials; ponding.
Osier: Os	Severe: poor natural drainage, water table seasonally at surface	Severe. poor natural drainage, water table seasonally at surface.	Severe: poor natural drainage, water table seasonally at surface.	Severe: poor natural drainage, water table seasonally at surface.
Pocomoke: Pm	Severe: very poor natural drainage; water table seasonally at surface.	Severe very poor natural drainage, water table seasonally at surface.	Severe: very poor natural drainage; water table seasonally at surface.	Severe: very poor natural drainage; water table seasonally at surface.
Portsmouth: Pt	Severe very poor natural drainage, water table seasonally at surface.	Severe: very poor natural drainage; water table seasonally at surface.	Severe: very poor natural drainage, water table seasonally at surface.	Severe: very poor natural drainage, water table seasonally at surface.
Rumford.				
RuA	Moderate: loamy sand surface.	Moderate loamy sand surface.	Moderate. loamy sand surface.	Moderate: loamy sand surface.
RuB	Moderate loamy sand surface, 2 to 5 percent slope.	Moderate loamy sand surface.	Moderate: loamy sand surface.	Moderate: loamy sand surface.
RuC	Severe: 5 to 10 percent slope.	Moderate: loamy sand surface.	Moderate loamy sand surface.	Moderate: loamy sand surface.
Rutlege. Ry	Severe. very poor natural drainage; water table seasonally at surface.	Severe: very poor natural drainage, water table seasonally at surface.	Severe: very poor natural drainage, water table seasonally at surface.	Severe: very poor natural drainage; water table seasonally at surface.
Sassafras:				
SaA, SfA	Slight	Slight	Slight	Slight.
SaB, SfB	Moderate: 2 to 5 percent slope.	Slight	Slight	Slight.
SaC2	Severe: 5 to 10 percent slope.	Slight	Slight	Slight.
SaD	Severe: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.	Moderate: 10 to 15 percent slope.	Slight.
Swamp: Sw	Very severe: ponding, extremely poor trafficability.	Very severe: ponding; extremely poor trafficability.	Very severe: ponding; extremely poor trafficability.	Very severe. ponding; extremely poor trafficability.
Tidal marsh Tf, Tm	Very severe tidal flooding, extremely poor trafficability.	Very severe tidal flooding, extremely poor trafficability.	Very severe tidal flooding, extremely poor trafficability.	Very severe: tidal flooding; extremely poor trafficability.
Woodstown: Wo, Ws	Moderate: moderately good natural drainage.	Moderate: moderately good natural drainage.	Moderate moderately good natural drainage.	Slight.

tides; and Swamp is unclassified sediments that are permanently waterlogged.

Relief

This county is a plain that slopes gently upward and westward from Delaware Bay and the Atlantic Ocean to the Chesapeake watershed and even more gently downward beyond that line. Local differences in elevation are only a few feet at most. In most of the county, the gradient is only a few feet per mile. The highest elevation in the county is about 78 feet.

Even though the local differences in elevation are slight, they have a strong influence on natural drainage. For example, in most places the moderately well drained Woodstown soils are only slightly lower than the adjacent, well drained Sassafras soils. Most of the poorly drained and very poorly drained soils of the county are in slight depressions and are only slightly lower in elevation than the soils of the surrounding landscape.

Time

Time is also important in soil formation and morphology. The most recent deposits in the county are those on alluvial flood plains and in marshy areas affected by tides. In such areas soil material is still being added whenever the areas are flooded. Most deposits, however,

Figure 17.—**Pond in Pocomoke sandy loam, near Bridgeville, constructed primarily for community esthetic value. Refer to table 7 for rating of this soil as a site for excavated ponds.**

have been in place long enough for distinct development and differentiation of soil horizons to have taken place. The highly siliceous material in the most sandy areas is resistant to change, even over very long periods of time.

Processes of Soil Formation

The differentiation of horizons in soils is the result of one or more of the following processes. (1) accumulation of organic matter; (2) leaching of carbonates and more soluble minerals; (3) chemical weathering (chiefly by hydrolysis) of primary minerals into silicate clay minerals; (4) translocation of the silicate clays, and probably some silt-sized particles, from one horizon to another; and (5) reduction and transfer of iron.

Several of these processes have been active in the formation of most soils of this county. The interaction of the first four processes is reflected in the strongly expressed horizons of the Sassafras and Kalmia soils, and all five processes have been active in the formation of the moderately well drained Keyport, Matawan, and Woodstown soils. Only the processes of accumulation of organic matter and transfer of iron have had much effect on the Johnston, Osier, and Rutlege soils. Most soil materials were low in carbonates and the more soluble materials when they were deposited, and some of the other processes may have been active.

Some organic matter has accumulated in all the soils to form the immediate surface layer, or A1 horizon. The organic-matter content ranges from very low in the Evesboro soils to high or very high in the Berryland, Johnston, Pocomoke, Portsmouth, and Rutlege soils and in Muck. The A1 horizon becomes part of the Ap horizon through tillage and thus loses its identity.

The translocation of clay minerals is largely responsible for the development of the Bt horizon that is contained in many soils. Silicate clay minerals removed from the A horizon have been immobilized, at least in part, in the Bt horizon. This is characteristic of soils of the Elkton, Fallsington, Kalmia, Kenansville, Keyport, Matawan,

Pocomoke, Portsmouth, Rumford, Sassafras, and Woodstown series, which occupy about 57 percent of the county.

The reduction and transfer of iron have occurred in all soils that do not have good natural drainage. This process, known as gleying, has been especially important in the formation of Berryland, Elkton, Fallsington, Osier, Pocomoke, Portsmouth, and Rutlege soils. A part of the iron is commonly reoxidized and segregated, forming the yellowish-brown, strong-brown, and other bright-colored mottles on an essentially gray matrix in the subsoil.

If silicate clay forms from primary minerals, some iron is commonly freed as hydrated oxide. These oxides are more or less red and, even when present in small amounts, give at least a brownish color to the soil material. They are largely responsible for the colors that dominate the subsoil of the Kalmia, Kenansville, Rumford, and Sassafras soils and the upper part of the subsoil of the Keyport, Matawan, and Woodstown soils.

Classification of the Soils

Soils are classified so that we can more easily remember their significant characteristics, assemble knowledge about them, see their relationships to each other and to the whole environment, and develop principles that will help us to understand their behavior and response to use. First through classification and then through the use of soil maps, we can apply our knowledge of soils to specific fields and other tracts of land.

The classification system now generally used was adopted by the National Cooperative Soil Survey in 1965 (*7*) and was supplemented in 1967, 1968, and 1971. It replaced the system adopted in 1938 (*3*) and later revised (*5*). Readers interested in the development of the current system should refer to available literature (*4*).

The current system consists of six categories. Beginning with the most inclusive, these categories are the order, the suborder, the great group, the subgroup, the family, and the series. The criteria for classification are soil properties that are measurable or observable, but the properties are selected so that soils of similar genesis are grouped together. Placement of some soil series in the current system of classification, particularly in families, may change as more precise information becomes available.

Table 13 shows the classification of the soil series of Sussex County according to both the current system and the great soil group of the 1938 system. The categories of the current system are defined briefly in the following paragraphs.

ORDER.—Soils are grouped into orders according to properties that seem to have resulted from the same processes acting to about the same degree on the parent material. Ten soil orders are recognized in the current system: Entisols, Vertisols, Inceptisols, Mollisols, Aridisols, Spodosols, Alfisols, Ultisols, Oxisols, and Histosols. The properties used to differentiate the soil orders are those that tend to give broad climatic groupings of soils. Two exceptions, Entisols and Histosols, occur in many different climates. Five of the ten soil orders occur in Sussex County: Entisols, Inceptisols, Spodosols, Ultisols, and Histosols.

Entisols are recent soils in which there has been no significant horizon development. This order is represented in the county by soils of the Evesboro, Osier, and Klej series. In some areas of Swamp and of Tidal marsh the soil material, unclassified or only partly classified, is probably of this order.

Inceptisols are soils in which there are beginnings of horizon development; they occur mostly on young land surfaces. This order is represented in Sussex County by

TABLE 13.—*Classification of soil series into higher categories*

Series	Current classification: Family	Subgroup	Order	1938 classification by great soil groups
Berryland	Sandy, siliceous, mesic, ortstein	Typic Haplaquods	Spodosols	Ground-Water Podzols.
Elkton	Clayey, mixed, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils
Evesboro	Mesic, coated	Typic Quartzipsamments	Entisols	Regosols.
Fallsington	Fine-loamy, siliceous, mesic	Typic Ochraquults	Ultisols	Low-Humic Gley soils.
Johnston	Coarse-loamy, siliceous, acid, thermic	Cumulic Humaquepts	Inceptisols	Humic Gley soils
Kalmia	Fine-loamy, siliceous, thermic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Kenansville	Loamy, siliceous, thermic	Arenic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Keyport	Clayey, mixed, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Klej	Mesic, coated	Aquic Quartzipsamments	Entisols	Regosols.
Matawan	Fine-loamy, siliceous, mesic	Aquic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Muck [1]	Acid, sandy, thermic	Terric Medisaprists	Histosols	Bog soils.
Osier	Siliceous, thermic	Typic Psammaquents	Entisols	Regosols
Pocomoke	Coarse-loamy, siliceous, thermic	Typic Umbraquults	Ultisols	Humic Gley soils.
Portsmouth	Fine-loamy, siliceous, thermic	Typic Umbraquults	Ultisols	Humic Gley soils.
Rumford	Coarse-loamy, siliceous, thermic	Typic Hapludults	Ultisols	Red-Yellow Podzolic soils.
Rutlege	Sandy, siliceous, thermic	Typic Humaquepts	Inceptisols	Humic Gley soils.
Sassafras	Fine-loamy, siliceous, mesic	Typic Hapludults	Ultisols	Gray-Brown Podzolic soils.
Swamp [1]	(1)	(1)	Entisols and Inceptisols.	Not classified.
Tidal marsh, fresh.[1]	(1)	(1)	Entisols	Not classified.
Tidal marsh, salty.[1]	Fine-loamy, mixed, nonacid, thermic	Typic Sulfaquents	Entisols	Not classified.
Woodstown	Fine-loamy, siliceous, mesic	Aquic Hapludults	Ultisols	Gray-Brown Podzolic soils.

[1] Too variable to be classified in the category.

soils of the Johnston and Rutlege series. In some areas of Swamp and of Tidal marsh the soil material, unclassified or only partly classified, is probably of this order.

Spodosols are soils that have a subsoil horizon of accumulated iron or aluminum compounds, of organic materials, or both. This order is represented in the county only by soils of the Berryland series.

Ultisols are mineral soils that contain a clay-enriched B horizon that has less than 35 percent base saturation. The base saturation commonly decreases with increasing depth. This order is represented in the county by soils of the Elkton, Fallsington, Kalmia, Kenansville, Keyport, Matawan, Pocomoke, Portsmouth, Rumford, Sassafras, and Woodstown series.

Histosols are soils in which the solum consists primarily of organic material and any mineral material is of only secondary importance. This order is represented in the county only by Muck.

SUBORDER.—Each order is divided into suborders, primarily on the basis of soil characteristics that seem to produce classes having the greatest genetic similarity. The soil properties are mainly those that reflect either the presence or absence of waterlogging, or differences in climate or vegetation. The climatic range of the suborders is narrower than that of the orders.

GREAT GROUP.—Each suborder is divided into great groups, on the basis of uniformity in the kinds and sequence of major horizons and soil features. The horizons considered are those in which clay, iron, or humus has accumulated and those that have pans that interfere with the growth of roots or the movement of water. The features considered are the self-mulching properties of clay, soil temperature, chemical composition (mainly calcium, magnesium, sodium, and potassium), and the like. The great group can be identified in the column headed "Subgroup" in table 13; it is the second word in the name of the subgroup.

SUBGROUP.—Each great group is divided into subgroups, one representing the central (typic) segment of the great group, and others, called intergrades, that have major properties of one great group but also one or more properties of another great group, suborder, or order. Subgroups are also established in instances where soil properties intergrade outside the range of any other great group, suborder, or order.

FAMILY.—Families are established within each subgroup, primarily on the basis of properties that affect the growth of plants or the behavior of soils when used for engineering purposes. Among the properties considered are texture, mineralogy, reaction, soil temperature, permeability, thickness of horizons, and consistence.

SERIES.—The series is a group of soils that have major horizons that, except for texture of the surface layer, are similar in important characteristics and in arrangement in the profile. It should be emphasized that any one soil series can belong to only one soil family.

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Glossary

Available moisture capacity. The capacity of soils to hold water available for use by most plants It is commonly defined as the difference between the amount of soil water at field capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt

Clay film. A thin coating of clay on the surface of a soil aggregate. Synonyms clay coat, clay skin

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers Terms commonly used to decribe consistence are—

Loose —Noncoherent when dry or moist, does not hold together in a mass

Friable —When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic —When wet, readily deformed by moderate pressure but can be pressed into a lump, will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material, and tends to stretch somewhat and pull apart, rather than to pull free from other material

Hard.—When dry, moderately resistant to pressure, can be broken with difficulty between thumb and forefinger

Soft.—When dry, breaks into powder or individual grains under very slight pressure

Cemented.—Hard and brittle, little affected by moistening.

Cover crop. A close-growing crop grown between periods of regular crop production, primarily to improve and protect the soil; or a crop grown between trees and vines in orchards and vineyards.

Drainage class (natural). Refers to the conditions of frequency and duration of periods of saturation or partial saturation that existed during the development of the soil, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven different classes of natural soil drainage are recognized

Excessively drained soils are commonly very porous and rapidly permeable and have a low water-holding capacity.

Somewhat excessively drained soils are also very permeable and are free from mottling throughout their profile.

Well-drained soils are nearly free from mottling and are commonly of intermediate texture

Moderately well drained soils commonly have a slowly permeable layer in or immediately beneath the solum. They have uniform

color in the A and upper B horizons and have mottling in the lower B and the C horizons

Somewhat poorly drained soils are wet for significant periods but not all the time, and some soils commonly have mottling at a depth below 6 to 16 inches

Poorly drained soils are wet for long periods and are light gray and generally mottled from the surface downward, although mottling may be absent or nearly so in some soils

Very poorly drained soils are wet nearly all the time They have a dark-gray or black surface layer and are gray or light gray, with or without mottling, in the deeper parts of the profile

Erosion. The wearing away of the land surface by wind (sandblast), running water, and other geological agents

Fertility, soil. The quality of a soil that enables it to provide compounds, in adquate amounts and in proper balance, for the growth of specified plants, when other growth factors such as light, moisture, temperature, and the physical condition of the soil are favorable

Flood plain. Nearly level land, consisting of stream sediments, that borders a stream and is subject to flooding unless protected artificially.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, and covered with grass for protection against erosion, used to conduct surface water away from cropland

Gravel. Rounded or angular rock fragments that are not prominently flattened and are up to 3 inches in diameter

Gully. A miniature valley with steep sides, cut by running water, through which water ordinarily runs only after rain Generally an obstacle to farm machinery, and too deep to be obliterated by ordinary tillage.

Habitat. The natural abode of a plant or animal; it refers to the kind of environment in which the plant or animal ordinarily lives, as opposed to its range or geographical distribution.

Hardpan. A hardened or cemented soil horizon, or layer The soil material may be sandy or clayey, and it may be cemented by iron oxide, silica, calcium carbonate, or other substance

Horizon, soil. A layer of soil, approximately parallel to the surface, that has distinct characteristics produced by soil-forming processes. These are the major horizons.

O horizon.—The layer of organic matter on the surface of a mineral soil. This layer consists of decaying plant residues

A horizon.—The mineral horizon at the surface or just below an O horizon. This horizon is the one in which living organisms are most active and therefore is marked by the accumulation of humus The horizon may have lost one or more of soluble salts, clay, and sesquioxides (iron and aluminum oxides).

B horizon —The mineral horizon below an A horizon. The B horizon is in part a layer of change from the overlying A to the underlying C horizon The B horizon also has distinctive characteristics caused (1) by accumulation of clay, sesquioxides, humus, or some combination of these, (2) by prismatic or blocky structure, (3) by redder or stronger colors than the A horizon, or (4) by some combination of these Combined A and B horizons are usually called the solum, or true soil If a soil lacks a B horizon, the A horizon alone is the solum.

C horizon.—The weathered rock material immediately beneath the solum In most soils this material is presumed to be like that from which the overlying horizons were formed. If the material is known to be different from that in the solum, a Roman numeral precedes the letter C.

R layer.—Consolidated rock beneath the soil The rock usually underlies a C horizon but may be immediately beneath an A or B horizon

Infiltration. The downward entry of water into the immediate surface of the soil or other material, as contrasted with percolation, which is movement of water through soil layers or material

Irrigation. Application of water to soils to assist in production of crops A sprinkler system of irrigation is one in which water is sprayed over the soil surface through pipes or nozzles from a pressure system

Leaching. The removal of soluble material from soils or other material by percolating water

Mottling, soil. Irregularly marked with spots of different colors that vary in number and size Mottling in soils usually indicates poor aeration and lack of drainage. Descriptive terms are as follows Abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse,* and contrast—*faint, distinct,* and *prominent.* The size measurements are these: *fine,* less than 5 millimeters (about 0 2 inch) in diameter along the greatest dimension, *medium,* ranging from 5 millimeters to 15 millimeters (about 0.2 to 0 6 inch) in diameter along the greatest dimension; and *coarse,* more than 15 millimeters (about 0.6 inch) in diameter along the greatest dimension

Muck. An organic soil consisting of fairly well decomposed organic material that is relatively high in mineral content, finely divided, and dark in color.

Munsell notation A system for designating color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with a hue of 10YR, a value of 6, and a chroma of 4

Nutrient, plant. Any element taken in by a plant, essential to its growth, and used by it in the production of food and tissue Nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, zinc, and perhaps other elements obtained from the soil, and carbon, hydrogen, and oxygen obtained largely from air and water, are plant nutrients.

Organic soil. A general term applied to a soil or a soil horizon that consists primarily of organic matter, such as peat soils, muck soils, and peaty soil layers

Peat. Unconsolidated soil material, largely undecomposed organic matter, that has accumulated where there has been excess moisture.

Permeability. The quality that enables the soil to transmit water or air. Terms used to describe permeability are as follows: *very slow, slow, moderately slow, moderate, moderate rapid, rapid,* and *very rapid* Classes of permeability are as follows

	Inches per hour
Slow or very slow	less than 0.20
Moderately slow	0 20–0.63
Moderate	0 63–2.0
Moderately rapid	2.0–6 3
Rapid or very rapid	more than 6.3

Profile, soil. A vertical section of the soil through all its horizons and extending into the parent material

Reaction, soil. The degree of acidity or alkalinity of a soil, expressed in pH values A soil that tests to pH 7 0 is precisely neutral in reaction because it is neither acid nor alkaline An acid, or "sour," soil is one that gives an acid reaction, an alkaline soil is one that is alkaline in reaction In words, the degrees of acidity or alkalinity are expressed thus

	pH		*pH*
Extremely acid	Below 4 5	Neutral	6.6 to 7.3
		Mildly alkaline	7.4 to 7 8
Very strongly acid.	4 5 to 5 0	Moderately alkaline.	7.9 to 8 4
Strongly acid	5 1 to 5 5	Strongly alkaline	8 5 to 9.0
Medium acid	5 6 to 6 0	Very strongly alkaline.	9 1 and higher
Slightly acid	6 1 to 6.5		

Relief. The elevations or inequalities of a land surface, considered collectively.

Sand. As a soil separate, the rock or mineral fragments that range in diameter from 0 05 to 2 0 millimeters Most sand grains consist of quartz, but they may be of any mineral composition. As a textural class, soil material that is 85 percent or more sand and not more than 10 percent clay.

Silt. As a soil separate, the mineral particles that range in diameter from the upper limit of clay (0 002 millimeter) to the lower limit of very fine sand (0 05 millimeter). As a textural class, soil material that is 80 percent or more silt and less than 12 percent clay.

Soil. A natural three-dimensional body on the earth's surface that supports plants and that has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles, less than 2 millimeters in equivalent diameter and ranging between specified size limits The names and sizes of separates recognized in the United States are as follows *Very coarse sand* (2 0 to 1 0 millimeter). *coarse sand* (1.0 to 0.5 millimeter); *medium sand* (0 5 to 0.25 millimeter), *fine sand* (0 25 to 0 10 millimeter), *very fine sand* (0 10 to 0 05 millimeter); *silt* (0 05 to 0.002 millimeter), and *clay* (less than 0 002 millimeter). The separates recognized by the International Society of Soil Science are as follows: I (2.0 to 0.2 millimeter), II (0.2 to 0.02 millimeter); III (0.02 to 0.002 millimeter); IV (less than 0.002 millimeter).

Solum. The upper part of a soil profile, above the parent material, in which the processes of soil formation are active The solum in mature soil includes the A and B horizons Generally, the characteristics of the material in these horizons are unlike those of the underlying material The living roots and other plant and animal life characteristic of the soil are largely confined to the solum.

Structure, soil. The arrangement of primary soil particles into compound particles or clusters that are separated from adjoining aggregates and have properties unlike those of an equal mass of unaggregated primary soil particles The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular* Structureless soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering together without any regular cleavage, as in many claypans and hardpans).

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Substratum. Technically, the part of the soil below the solum.

Surface soil. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, about 5 to 8 inches in thickness. The plowed layer.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Tilth, soil. The condition of the soil in relation to the growth of plants, especially soil structure Good tilth refers to the friable state and is associated with high noncapillary porosity and stable, granular structure A soil in poor tilth is nonfriable, hard, nonaggregated, and difficult to till.

Topsoil. A presumed fertile soil or soil material, or one that responds to fertilization, ordinarily rich in organic matter, used to top-dress roadbanks, lawns, and gardens.

Upland. Land consisting of material unworked by water in recent geologic time and lying, in general, at a higher elevation than the alluvial plain or stream terrace.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places an upper, or perched, water table may be separated from a lower one by a dry zone.

GUIDE TO MAPPING UNITS

For a full description of a mapping unit, read both the description of the mapping unit and that of the soil series to which the mapping unit belongs. Information about management of the soils is also given in the mapping units. The capability classification is described on pages 34 and 35. The woodland subclass groups are described on pages 40 and 41. Other information is given in tables as follows:

Acreage and extent, table 3, page 11.
Estimated average yields, tables 4 and 5, pages 38 and 39.
Engineering uses of the soils, tables 8, 9, and 10, pages 50 to 61.
Town and country planning, table 11, page 62, and table 12, page 68.

Map symbol	Mapping unit	Described on page	Capability unit Symbol	Woodland subclass Symbol
Bd	Berryland loamy sand	12	IVw-6	3w
Bo	Borrow pits	12	VIIIs-4	--
Co	Coastal beach and dune land	12	VIIIs-2	5t
El	Elkton sandy loam	14	IIIw-11	3w
Em	Elkton loam	15	IIIw-9	3w
EoB	Evesboro sand, 0 to 5 percent slopes	15	VIIs-1	3s
EoD	Evesboro sand, 5 to 15 percent slopes	15	VIIs-1	3s
EsD	Evesboro loamy sand, 5 to 15 percent slopes	15	VIIs-1	3s
EvA	Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes	16	IIIs-1	2s
EvB	Evesboro loamy sand, loamy substratum, 2 to 5 percent slopes	16	IIIs-1	2s
Fa	Fallsington sandy loam	17	IIIw-6	2w
Fs	Fallsington loam	17	IIIw-7	2w
Ft	Fill land	18	--------	--
Jo	Johnston silt loam	19	VIIw-1	2w
Ka	Kalmia sandy loam	19	I-5	2o
KbA	Kenansville loamy sand, 0 to 2 percent slopes	20	IIs-4	3o
KbB	Kenansville loamy sand, 2 to 5 percent slopes	20	IIs-4	3o
KfA	Keyport fine sandy loam, 0 to 2 percent slopes	21	IIw-9	3w
KfB2	Keyport fine sandy loam, 2 to 5 percent slopes, eroded	21	IVe-9	3w
Kl	Klej loamy sand	22	IIIw-10	3s
Mm	Matawan loamy sand	23	IIs-5	2o
Mn	Matawan sandy loam	23	IIw-10	2o
Mu	Muck, shallow	24	IVw-7	2w
Os	Osier loamy sand	25	IVw-6	2w
Pm	Pocomoke sandy loam	26	IIIw-6	2w
Pt	Portsmouth loam	27	IIIw-7	2w
RuA	Rumford loamy sand, 0 to 2 percent slopes	27	IIs-4	3o
RuB	Rumford loamy sand, 2 to 5 percent slopes	28	IIs-4	3o
RuC	Rumford loamy sand, 5 to 10 percent slopes	28	IIIe-33	3o
Ry	Rutlege loamy sand	29	IVw-6	2w
SaA	Sassafras sandy loam, 0 to 2 percent slopes	30	I-5	3o
SaB	Sassafras sandy loam, 2 to 5 percent slopes	30	IIe-5	3o
SaC2	Sassafras sandy loam, 5 to 10 percent slopes, eroded	30	IIIe-5	3o
SaD	Sassafras sandy loam, 10 to 15 percent slopes	31	IVe-5	3o
SfA	Sassafras loam, 0 to 2 percent slopes	31	I-4	3o
SfB	Sassafras loam, 2 to 5 percent slopes	31	IIe-4	3o
Sw	Swamp	31	VIIw-1	--
Tf	Tidal marsh, fresh	32	VIIIw-1	--
Tm	Tidal marsh, salty	32	VIIIw-1	--
Wo	Woodstown sandy loam	33	IIw-5	2o
Ws	Woodstown loam	33	IIw-1	2o

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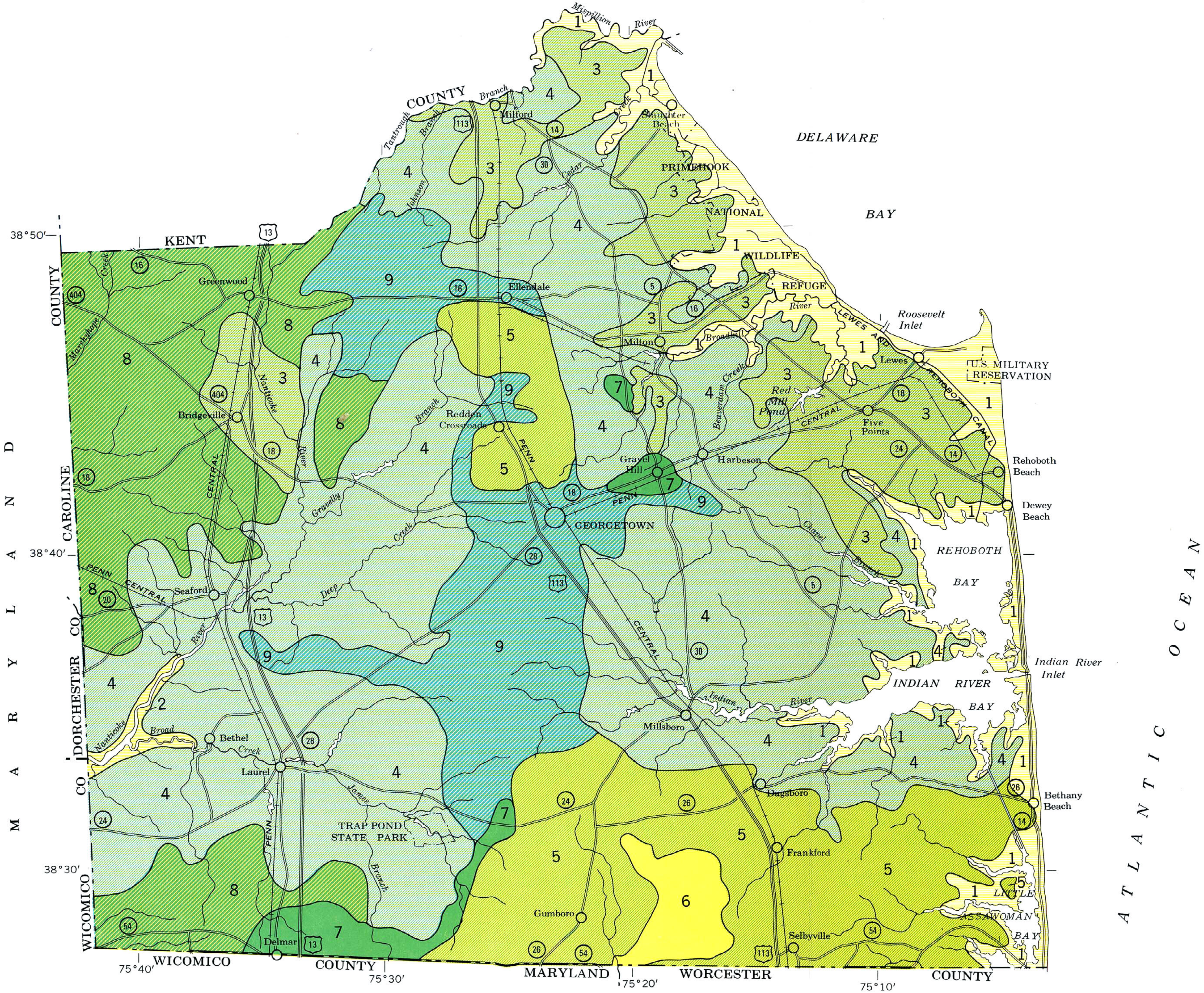
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

DELAWARE AGRICULTURAL EXPERIMENT STATION

SUSSEX COUNTY, DELAWARE

GENERAL SOIL MAP



1 0 1 2 3 4 Miles
Scale 1:253 440

N

SOIL ASSOCIATIONS

1 — Tidal marsh, salty-Coastal beach and dune land association: Low areas that are regularly flooded by salt water, and areas of loose, salty beach and dune sands

2 — Tidal marsh, fresh, association: Low areas that are regularly flooded by fresh-water tides

3 — Sassafras-Fallsington association: Well drained and poorly drained soils that have a moderately permeable subsoil of sandy loam to sandy clay loam

4 — Evesboro-Rumford association: Excessively drained and somewhat excessively drained soils that have a rapidly permeable subsoil of sand to sandy loam

5 — Pocomoke-Fallsington-Evesboro association: Very poorly drained and poorly drained soils that have a moderately permeable subsoil of sandy loam or sandy clay loam, and excessively drained soils that have a rapidly permeable sandy subsoil

6 — Muck-Pocomoke-Swamp association: Very poorly drained organic soils and soils that have a moderately permeable subsoil of sandy loam, and unclassified soils in fresh-water swamps

7 — Elkton-Matawan-Keyport association: Poorly drained and moderately well drained soils that have a slowly permeable, clayey subsoil

8 — Fallsington-Sassafras-Woodstown association: Poorly drained to well drained soils that have a moderately permeable subsoil of sandy clay loam or sandy loam

9 — Fallsington-Pocomoke-Woodstown association: Very poorly drained to moderately well drained soils that have a moderately permeable subsoil of sandy loam to sandy clay loam

This map is for general planning. It shows only the major soils and does not contain sufficient detail for operational planning.

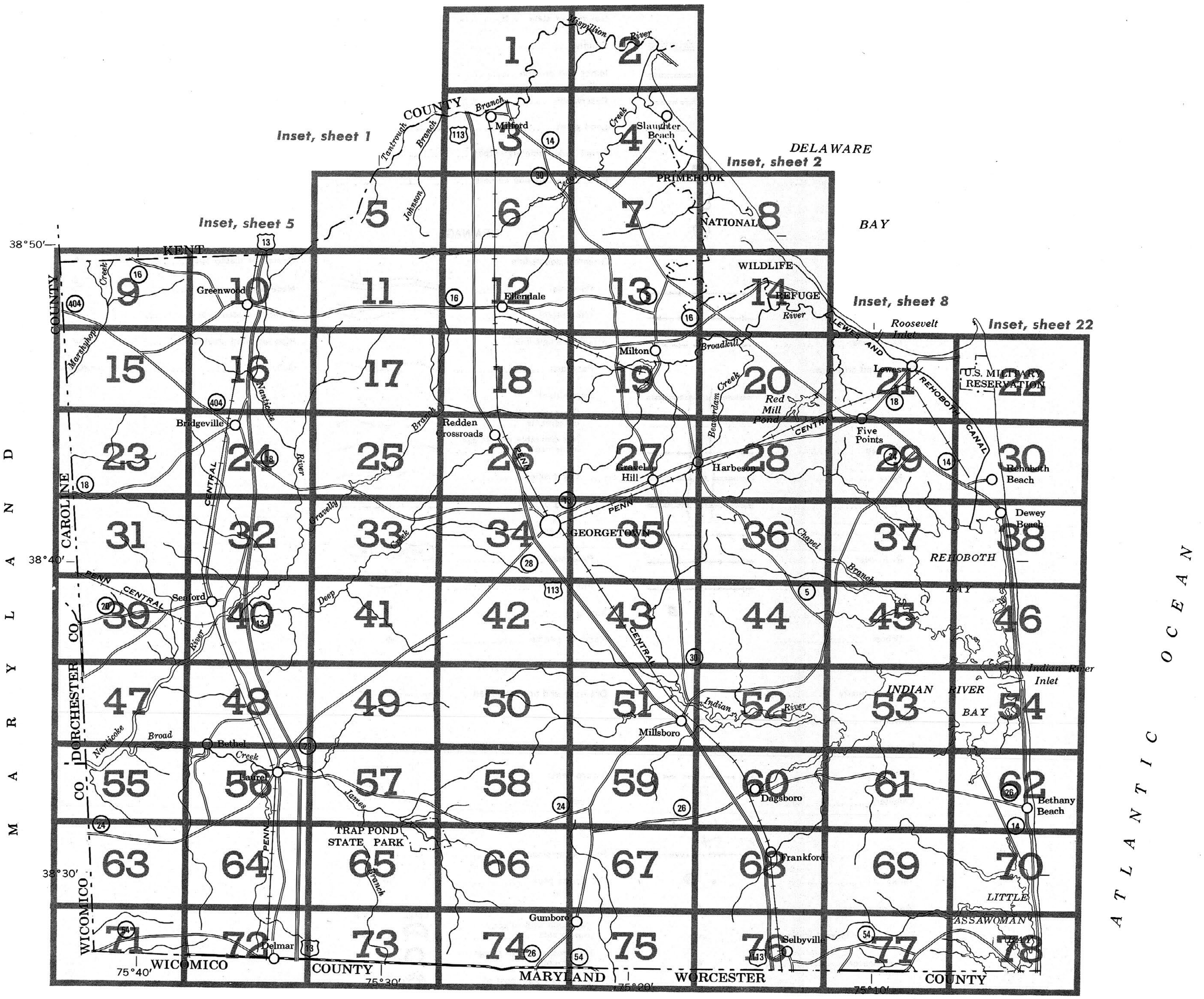
Compiled 1972

SUSSEX COUNTY, DELAWARE

INDEX TO MAP SHEETS

1 0 1 2 3 4 Miles
Scale 1:253 440

N



Compiled 1972

SOIL LEGEND

The first capital letter is the initial one of the soil name. A second capital letter, A, B, C, or D shows the slope. Most symbols without a slope letter are those of nearly level soils, but some are for land types that have a considerable range of slope. The number, 2, in the symbol indicates that the soil is moderately eroded.

SYMBOL	NAME
Bd	Berryland loamy sand
Bo	Borrow pits
Co	Coastal beach and Dune land
El	Elkton sandy loam
Em	Elkton loam
EoB	Evesboro sand, 0 to 5 percent slopes
EoD	Evesboro sand, 5 to 15 percent slopes
EsD	Evesboro loamy sand, 5 to 15 percent slopes
EvA	Evesboro loamy sand, loamy substratum, 0 to 2 percent slopes
EvB	Evesboro loamy sand, loamy substratum, 2 to 5 percent slopes
Fa	Fallsington sandy loam
Fs	Fallsington loam
Ft	Fill land
Jo	Johnston silt loam
Ka	Kalmia sandy loam
KbA	Kenansville loamy sand, 0 to 2 percent slopes
KbB	Kenansville loamy sand, 2 to 5 percent slopes
KfA	Keyport fine sandy loam, 0 to 2 percent slopes
KfB2	Keyport fine sandy loam, 2 to 5 percent slopes, eroded
Kl	Klej loamy sand
Mm	Matawan loamy sand
Mn	Matawan sandy loam
Mu	Muck, shallow
Os	Osier loamy sand
Pm	Pocomoke sandy loam
Pt	Portsmouth loam
RuA	Rumford loamy sand, 0 to 2 percent slopes
RuB	Rumford loamy sand, 0 to 5 percent slopes
RuC	Rumford loamy sand, 5 to 10 percent slopes
Ry	Rutlege loamy sand
SaA	Sassafras sandy loam, 0 to 2 percent slopes
SaB	Sassafras sandy loam, 2 to 5 percent slopes
SaC2	Sassafras sandy loam, 5 to 10 percent slopes, eroded
SaD	Sassafras sandy loam, 10 to 15 percent slopes
SfA	Sassafras loam, 0 to 2 percent slopes
SfB	Sassafras loam, 2 to 5 percent slopes
Sw	Swamp
Tf	Tidal marsh, fresh
Tm	Tidal marsh, salty
Wo	Woodstown sandy loam
Ws	Woodstown loam

CONVENTIONAL SIGNS

WORKS AND STRUCTURES

- Highways and roads
  - Divided
  - Good motor
  - Poor motor
  - Trail
- Highway markers
  - National Interstate
  - U. S.
  - State or county
- Railroads
  - Single track
  - Multiple track
  - Abandoned
- Bridges and crossings
  - Road
  - Trail
  - Railroad
  - Ferry — FY
  - Ford — FORD
  - Grade
  - R. R. over
  - R. R. under
- Buildings
  - School
  - Church
- Mine and quarry
- Gravel pit
- Power line
- Pipeline
- Cemetery
- Dams
- Levee
- Tanks
- Well, oil or gas
- Forest fire or lookout station
- Airway beacon
- Located object

BOUNDARIES

- National or state
- County
- Minor civil division
- Reservation
- Land grant
- Small park, cemetery, airport
- Land survey division corners

DRAINAGE

- Streams, double-line
  - Perennial
  - Intermittent
- Streams, single-line
  - Perennial
  - Intermittent
    - Crossable with tillage implements
    - Not crossable with tillage implements
    - Unclassified
- Canals and ditches
- Lakes and ponds
  - Perennial — water, w
  - Intermittent — int
- Spring
- Marsh or swamp
- Wet spot
- Drainage end or alluvial fan

RELIEF

- Escarpments
  - Bedrock
  - Other
- Short steep slope
- Prominent peak
- Depressions (Large, Small)
  - Crossable with tillage implements
  - Not crossable with tillage implements
  - Contains water most of the time

SOIL SURVEY DATA

- Soil boundary and symbol — Dx
- Gravel
- Stoniness
  - Stony
  - Very stony
- Rock outcrops
- Chert fragments
- Clay spot
- Sand spot
- Gumbo or scabby spot
- Made land
- Severely eroded spot
- Blowout, wind erosion
- Gully

SUSSEX COUNTY, DELAWARE NO. 1

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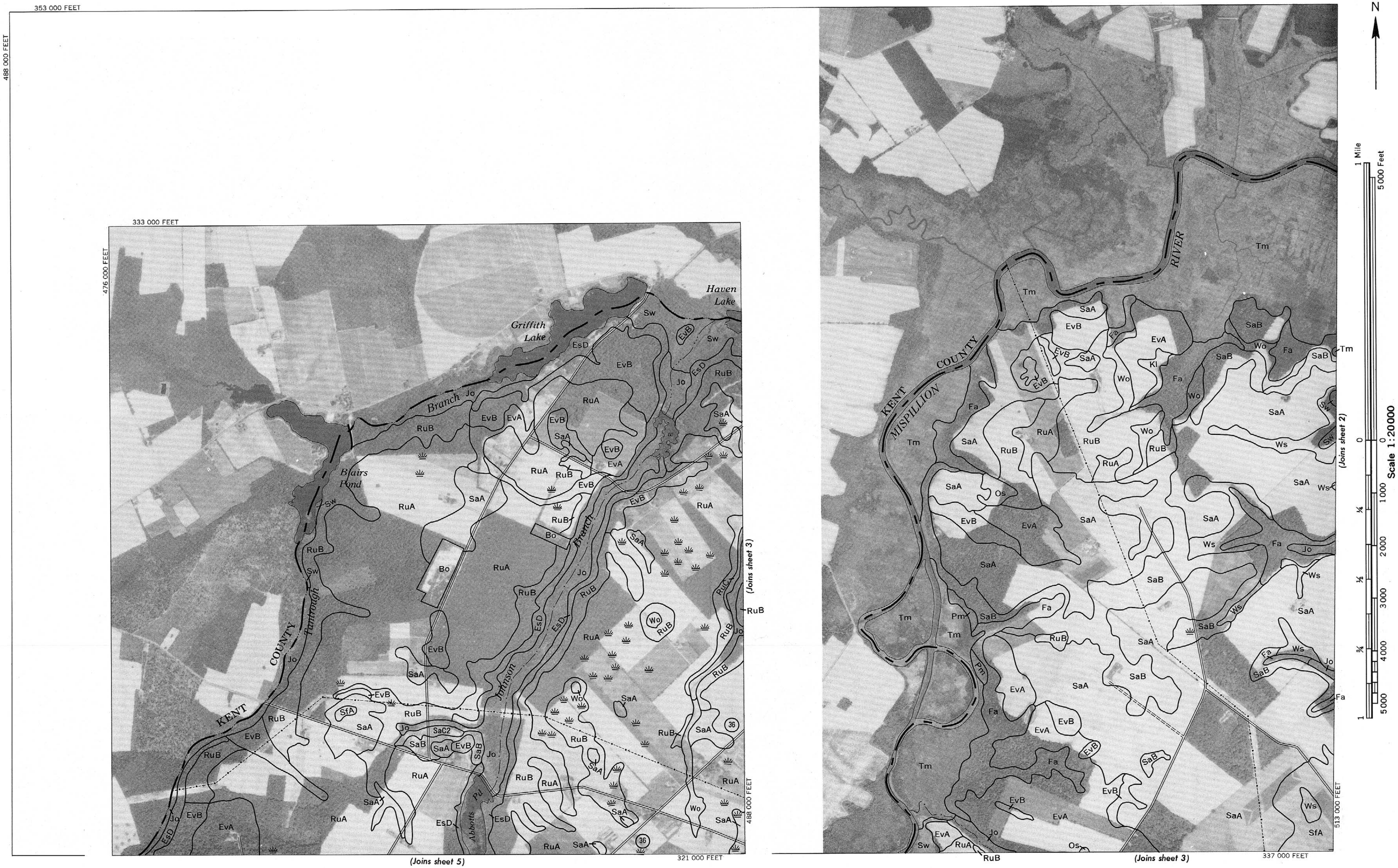
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.



SUSSEX COUNTY, DELAWARE — SHEET NUMBER 2

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

3

N

1 Mile
5000 Feet
Scale 1:20000

SUSSEX COUNTY, DELAWARE NO. 3

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SUSSEX COUNTY, DELAWARE — SHEET NUMBER 4

N

1 Mile
5 000 Feet
Scale 1:20000
0 1000 2000 3000 4000 5000
0 ¼ ½ ¾ 1

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

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5

SUSSEX COUNTY, DELAWARE NO. 5

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SUSSEX COUNTY, DELAWARE NO. 7

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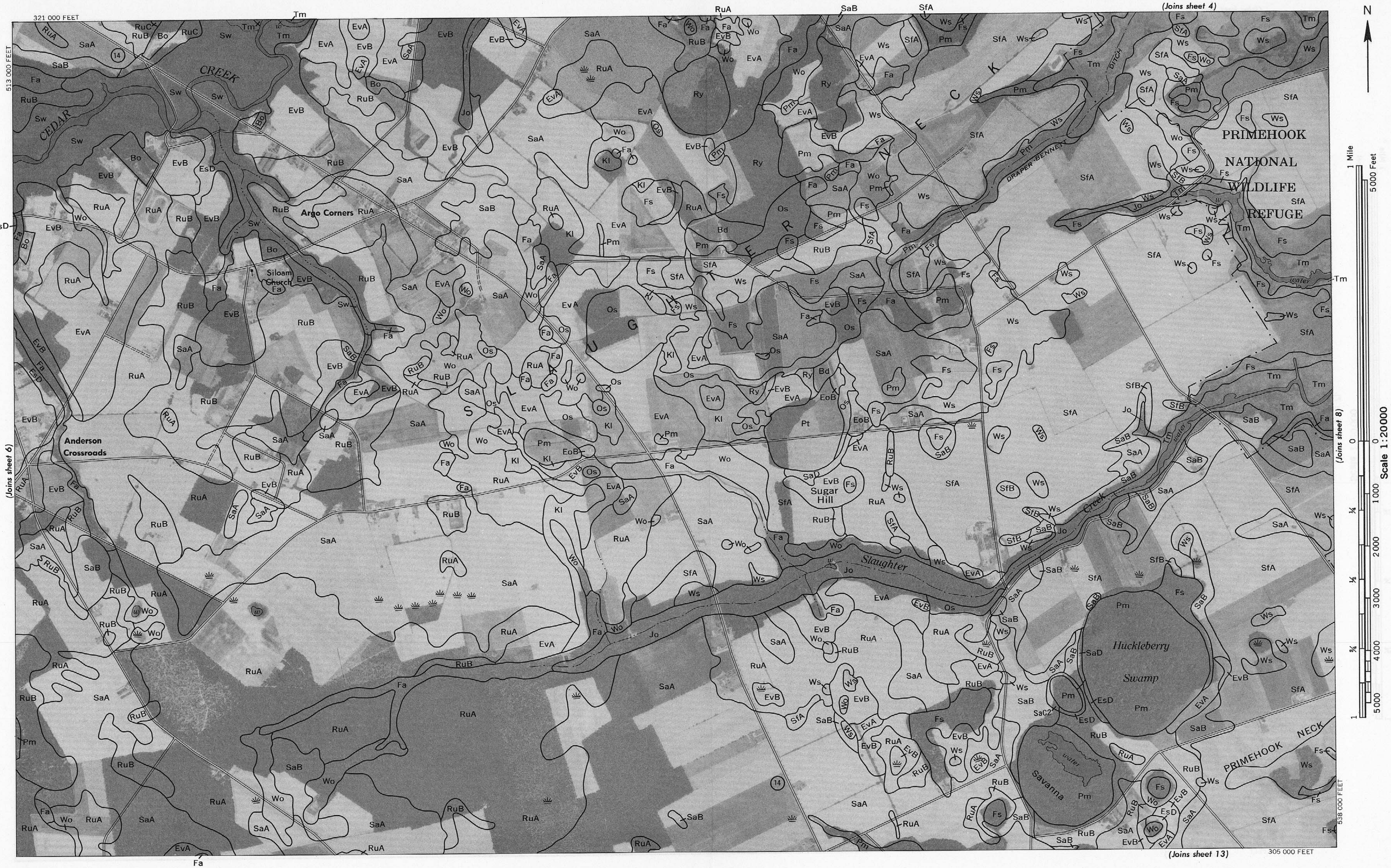

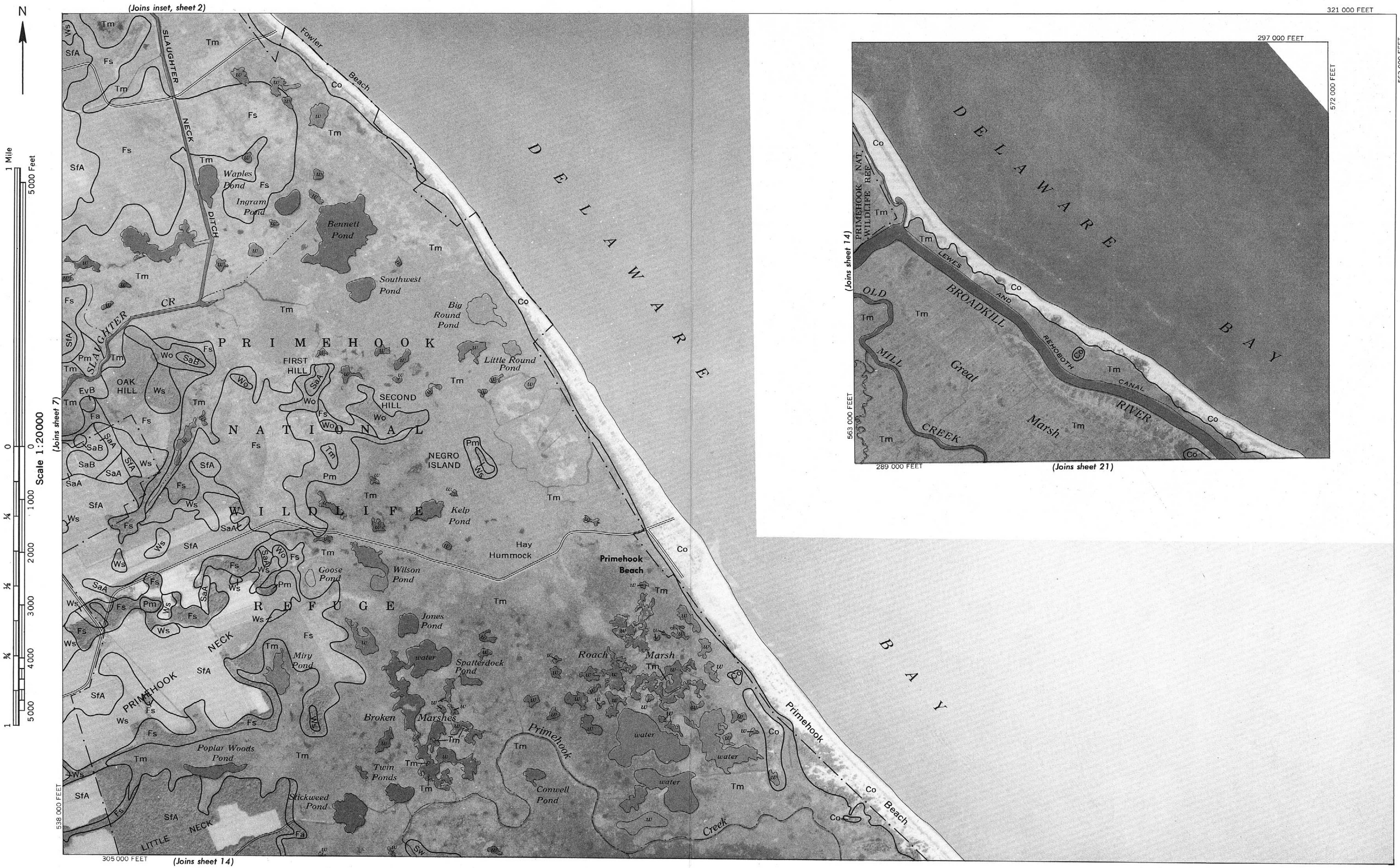

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

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N

305 000 FEET

413 000 FEET

(Joins sheet 10)

(Joins sheet 15)

438 000 FEET

289 000 FEET

1 Mile

5 000 Feet

Scale 1:20000

SUSSEX COUNTY, DELAWARE NO. 9

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

N

Scale 1:20000

1 Mile | ¾ | ½ | ¼ | 0

5000 Feet | 4000 | 3000 | 2000 | 1000 | 0 | 5000

(Joins inset sheet 5)

(Joins sheet 9)

(Joins sheet 11)

(Joins sheet 16)

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

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SUSSEX COUNTY, DELAWARE NO. 11

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N

Scale 1:20000

1 Mile

5000 Feet

0 ¼ ½ ¾ 1

0 1000 2000 3000 4000 5000

SUSSEX COUNTY, DELAWARE NO. 13

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Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

SUSSEX COUNTY, DELAWARE — SHEET NUMBER 14

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

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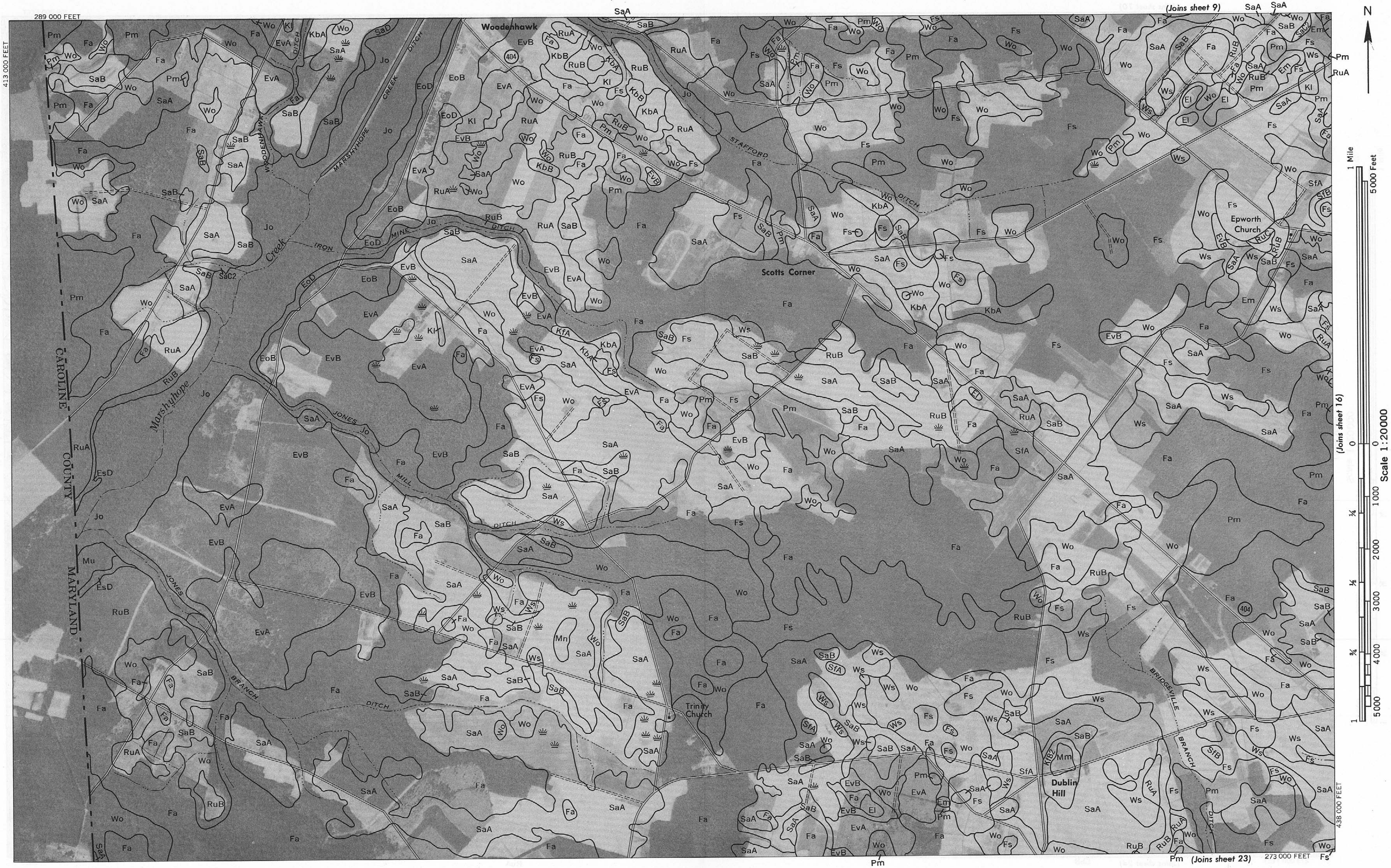
SUSSEX COUNTY, DELAWARE NO. 14



SUSSEX COUNTY, DELAWARE NO. 15

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Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

SUSSEX COUNTY, DELAWARE — SHEET NUMBER 16

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Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

SUSSEX COUNTY, DELAWARE NO. 16

SUSSEX COUNTY, DELAWARE NO. 17

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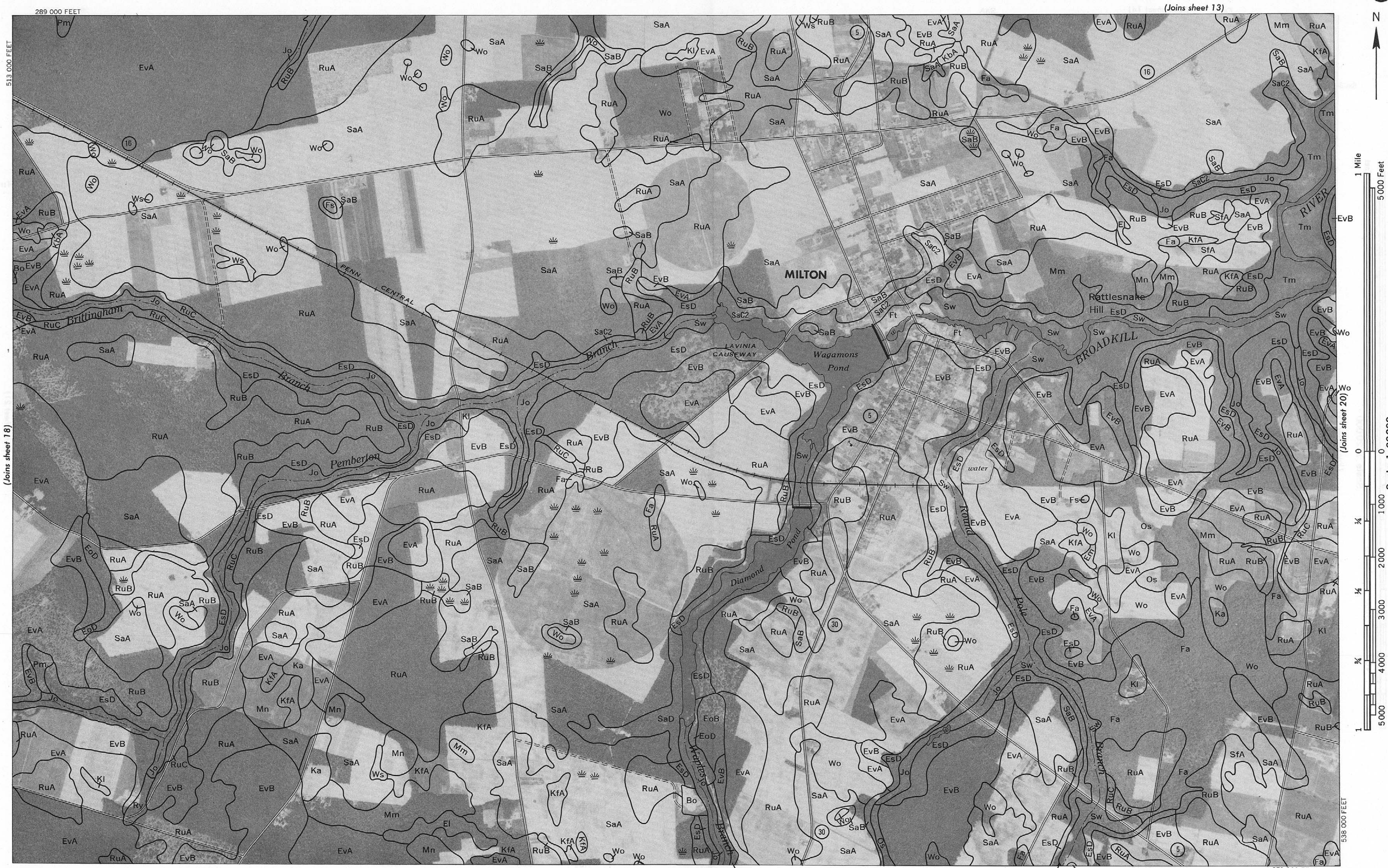
SUSSEX COUNTY, DELAWARE NO. 18



SUSSEX COUNTY, DELAWARE NO. 19

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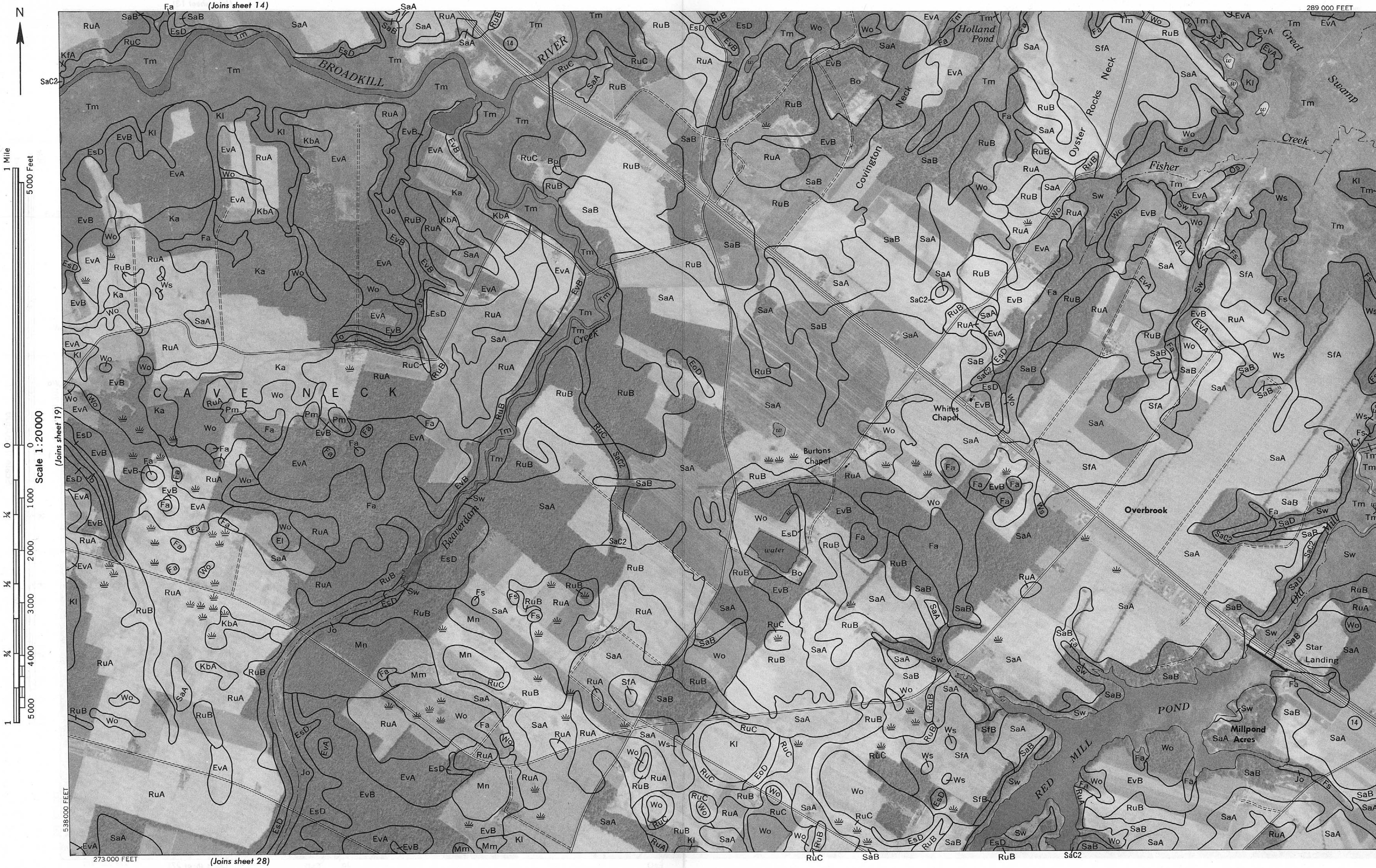

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SUSSEX COUNTY, DELAWARE NO. 20

SUSSEX COUNTY, DELAWARE NO. 21

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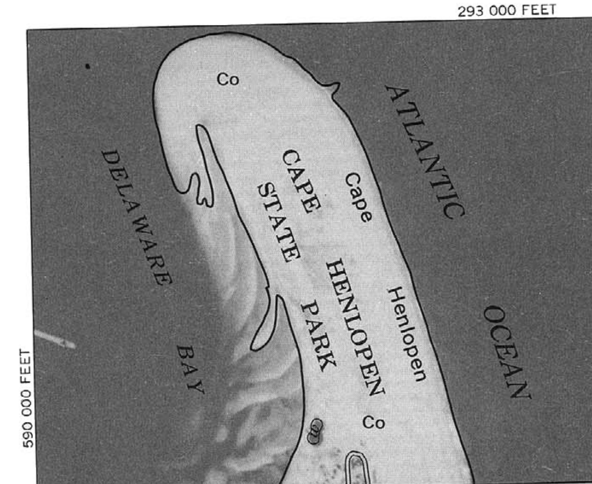
22

N

Scale 1:20000



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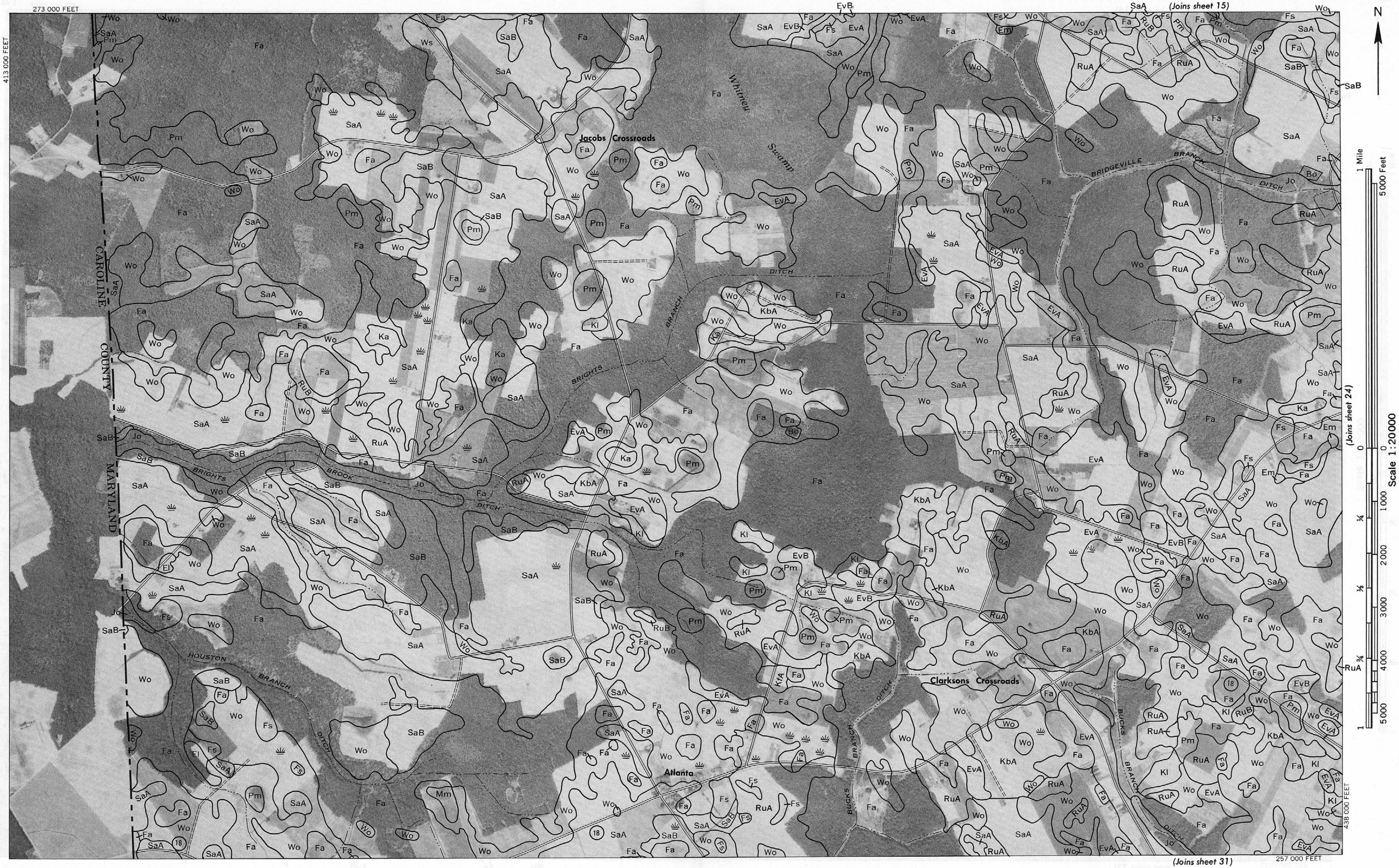

SUSSEX COUNTY, DELAWARE NO. 23

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SUSSEX COUNTY, DELAWARE NO. 25

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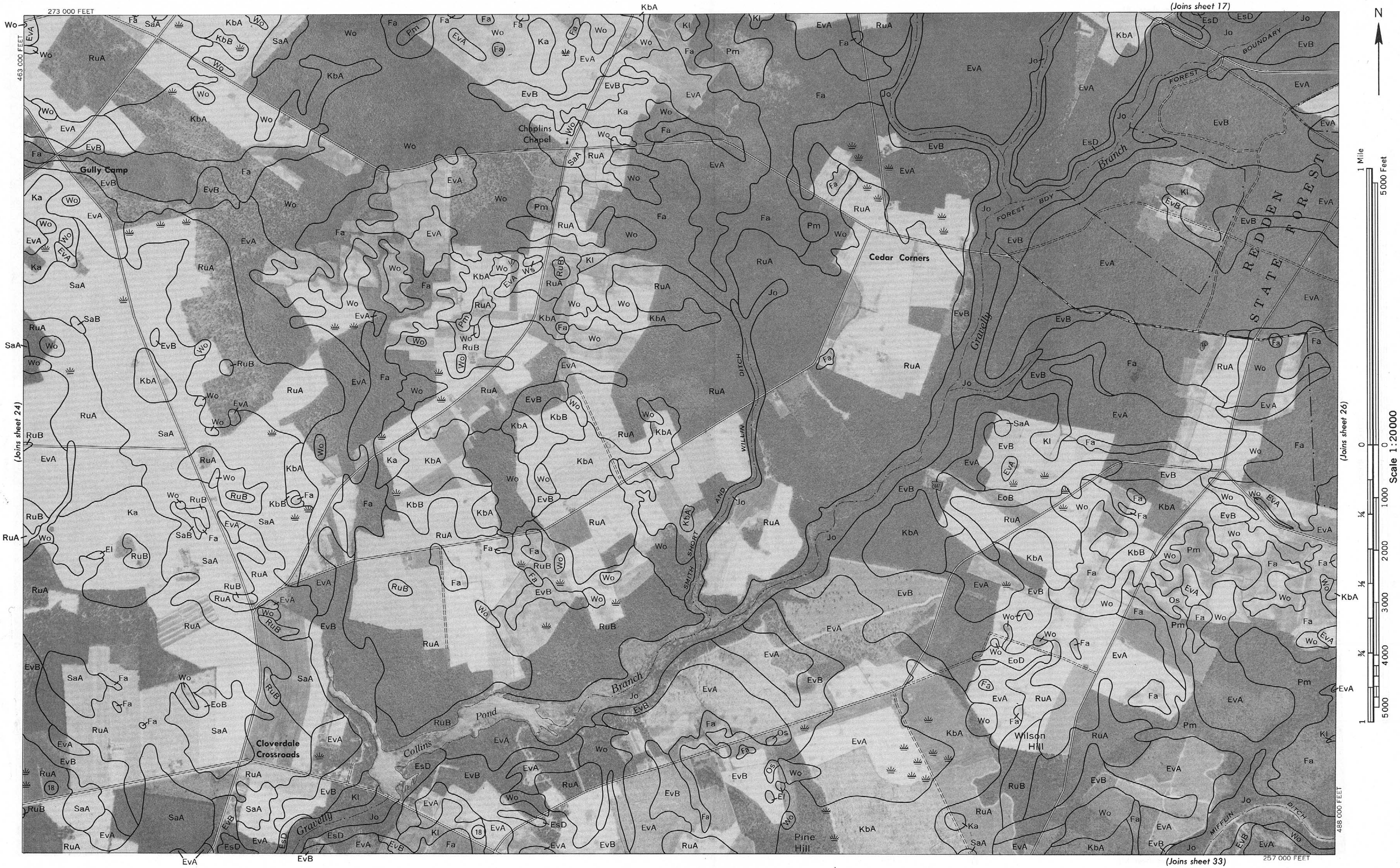

N

Scale 1:20000

1 Mile

5000 Feet

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

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SUSSEX COUNTY, DELAWARE NO. 27

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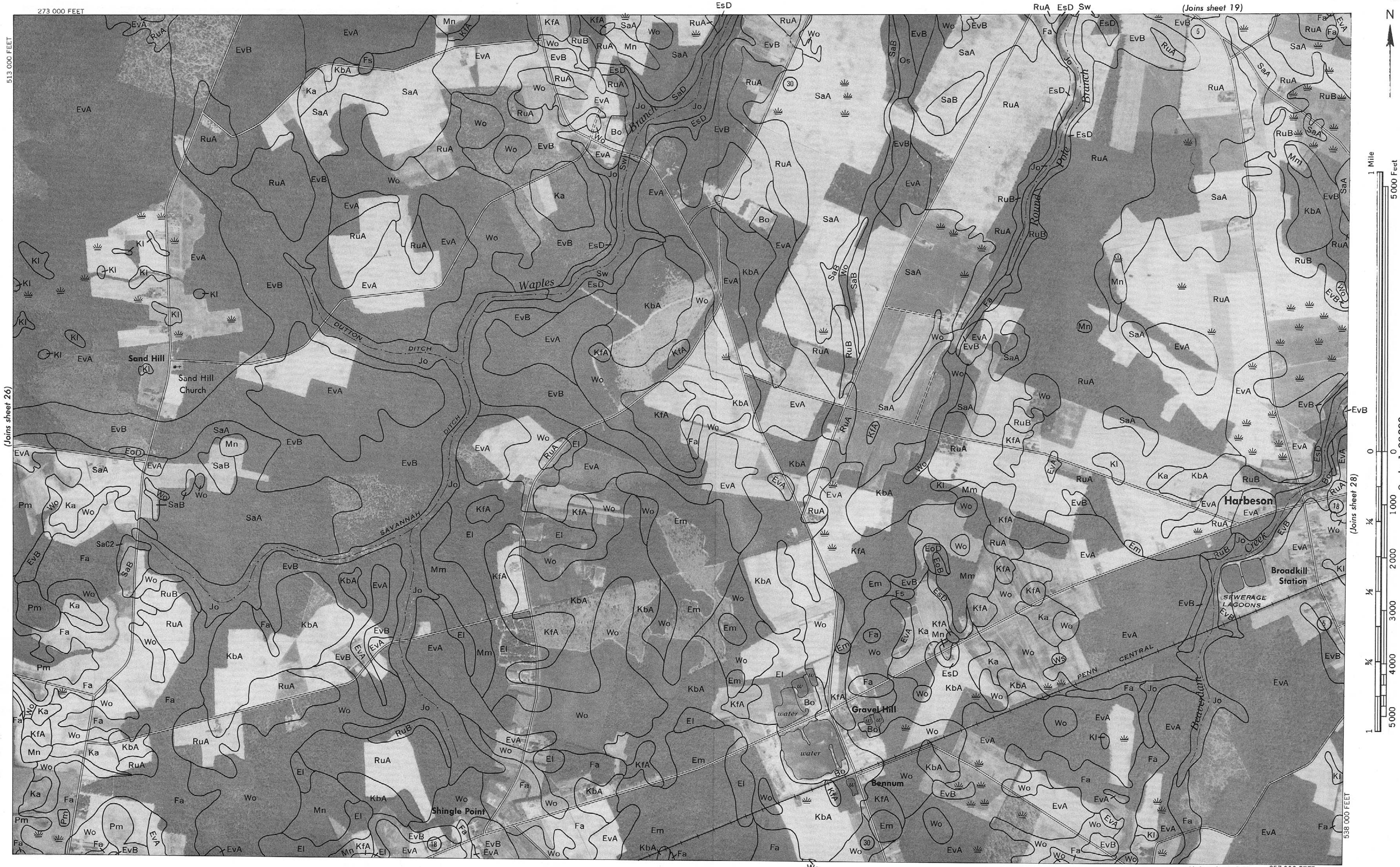

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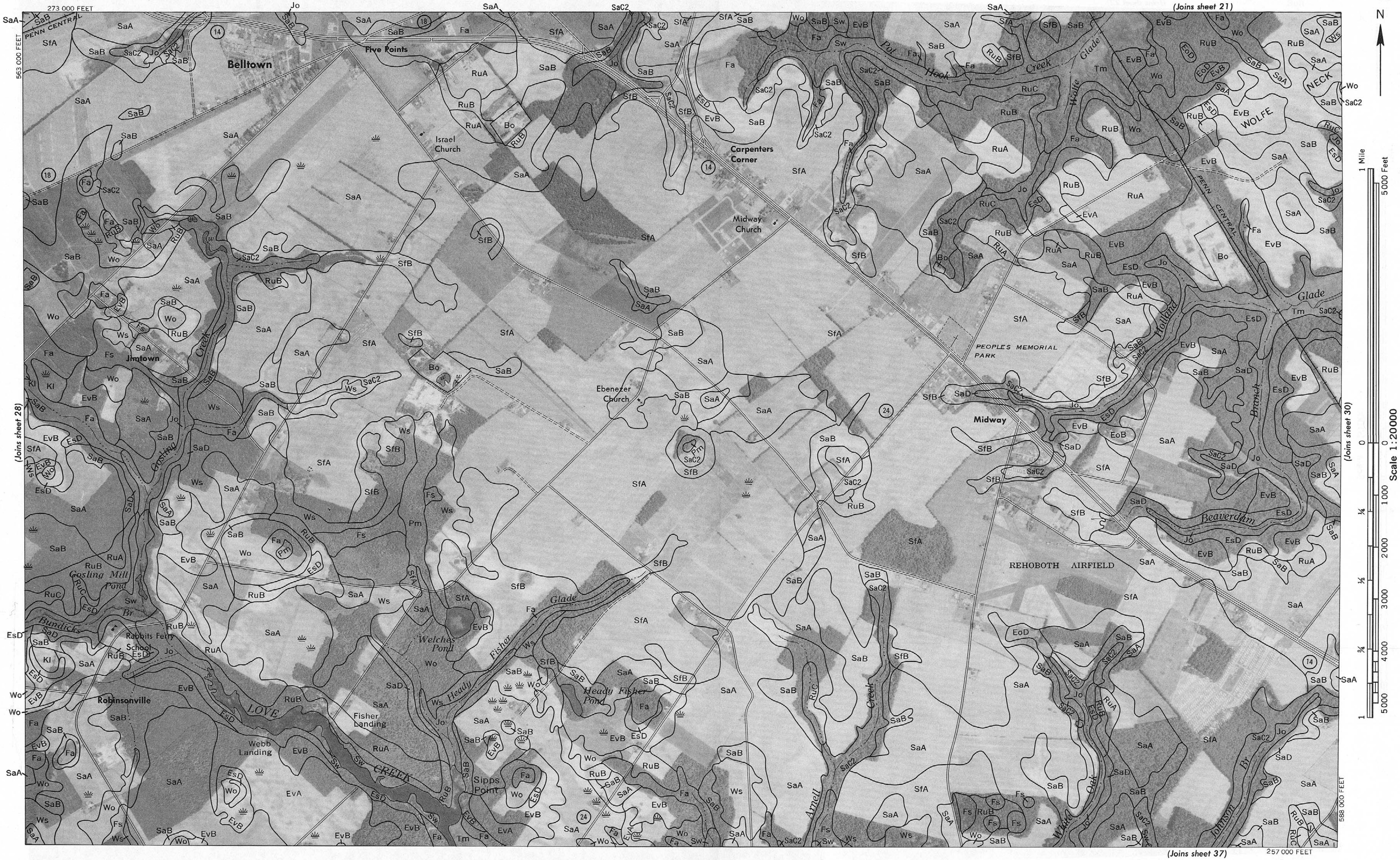
SUSSEX COUNTY, DELAWARE NO. 28

29



SUSSEX COUNTY, DELAWARE NO. 29

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(30)

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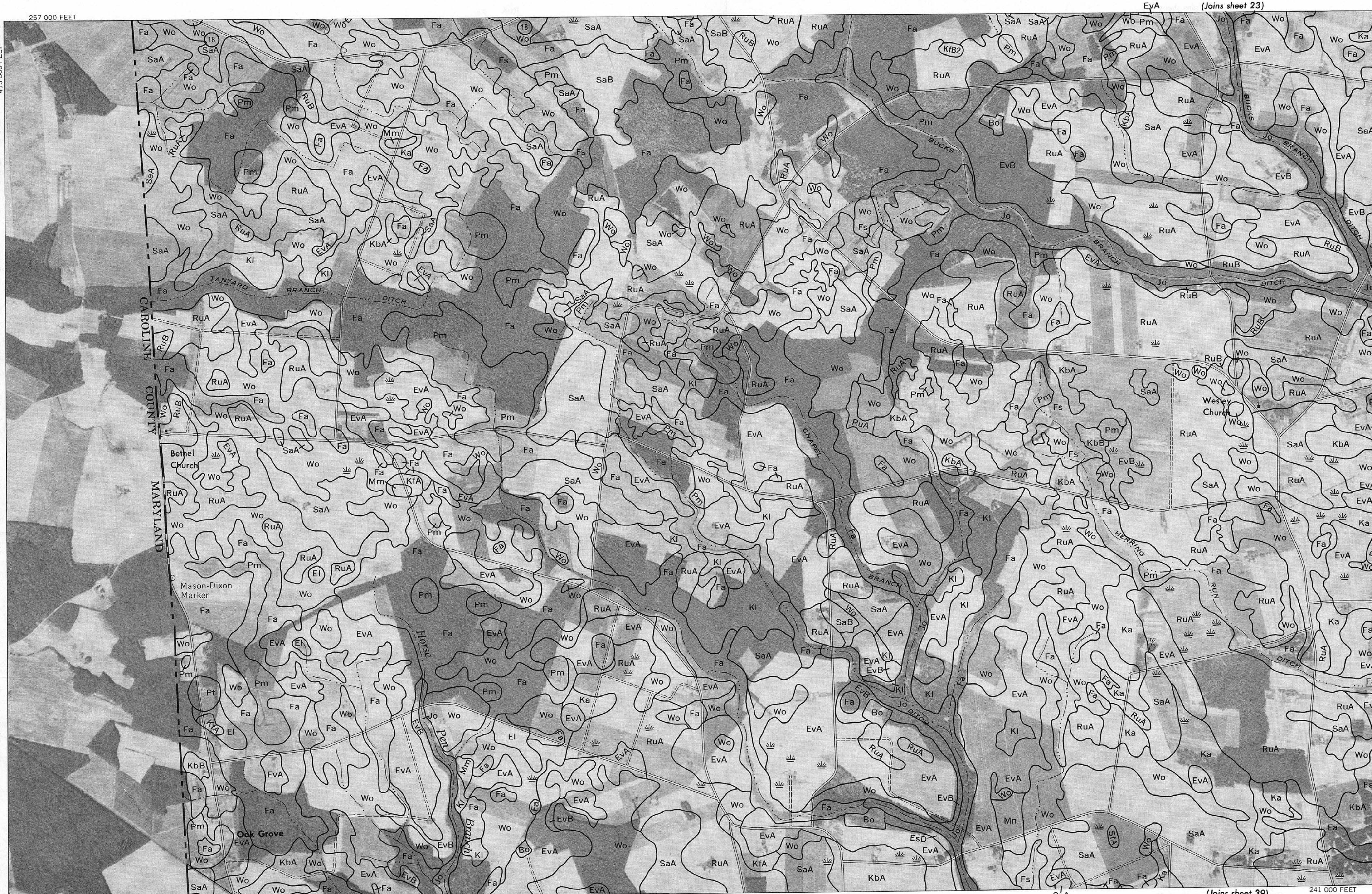

N

1 Mile

5000 Feet

Scale 1:20000

SUSSEX COUNTY, DELAWARE NO. 31

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N

1 Mile

5000 Feet

Scale 1:20000

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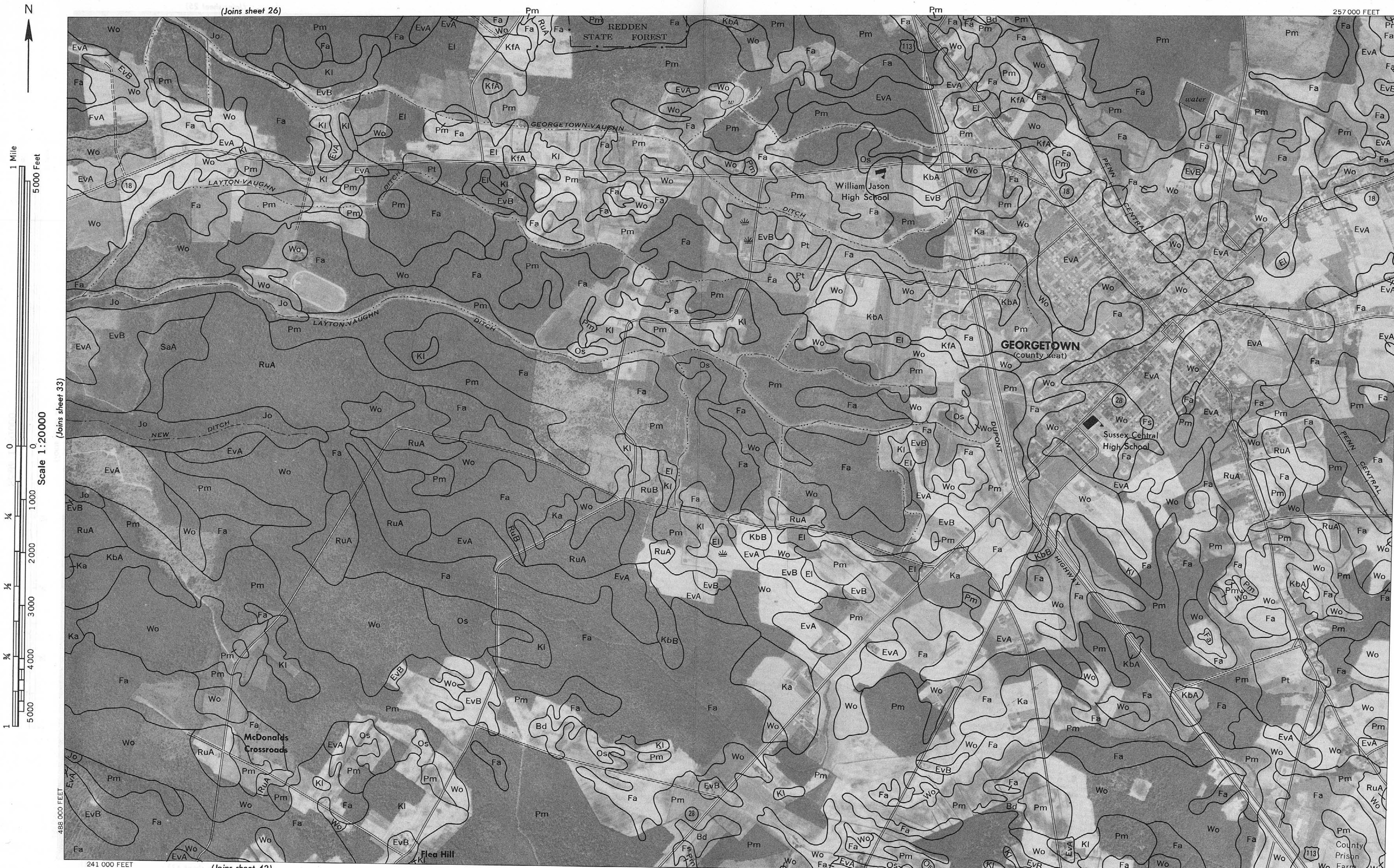

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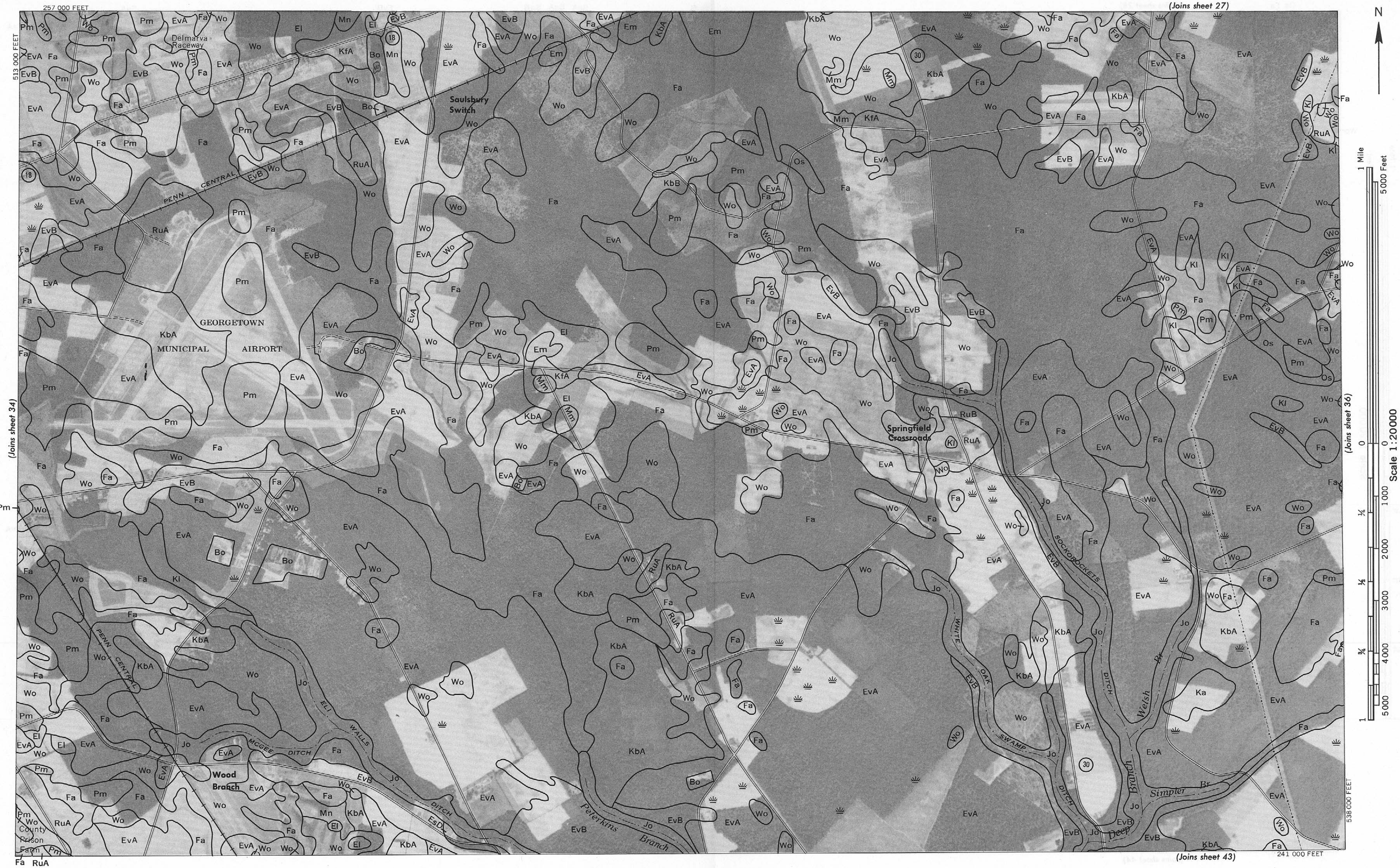
SUSSEX COUNTY, DELAWARE NO. 34



SUSSEX COUNTY, DELAWARE NO. 35

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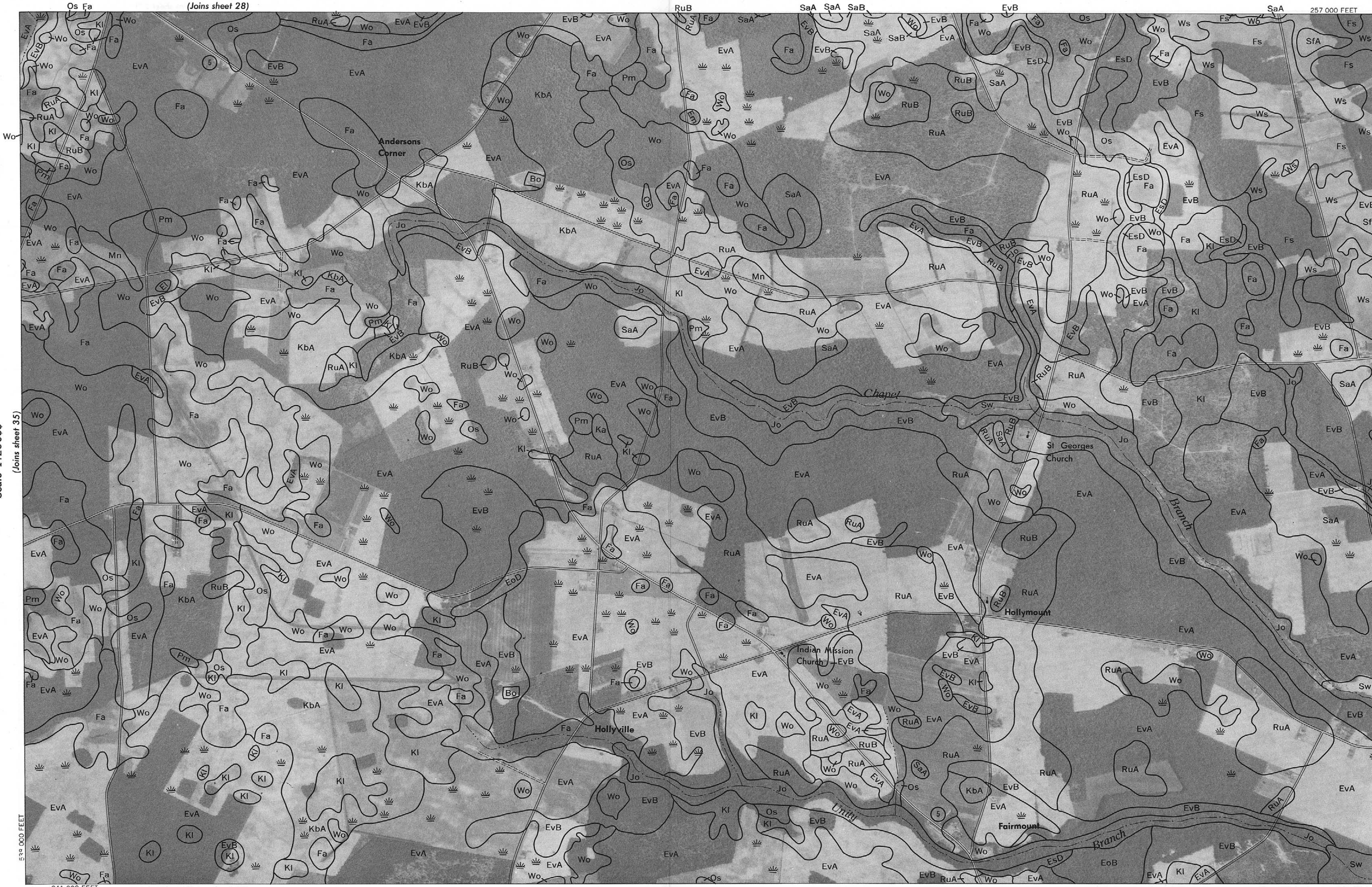
(Joins sheet 28)

N

1 Mile
5000 Feet
Scale 1:20000
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

(Joins sheet 35)



(Joins sheet 37)

(Joins sheet 44)

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.
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SUSSEX COUNTY, DELAWARE NO. 36

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SUSSEX COUNTY, DELAWARE NO. 39

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Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

SUSSEX COUNTY, DELAWARE — SHEET NUMBER 40

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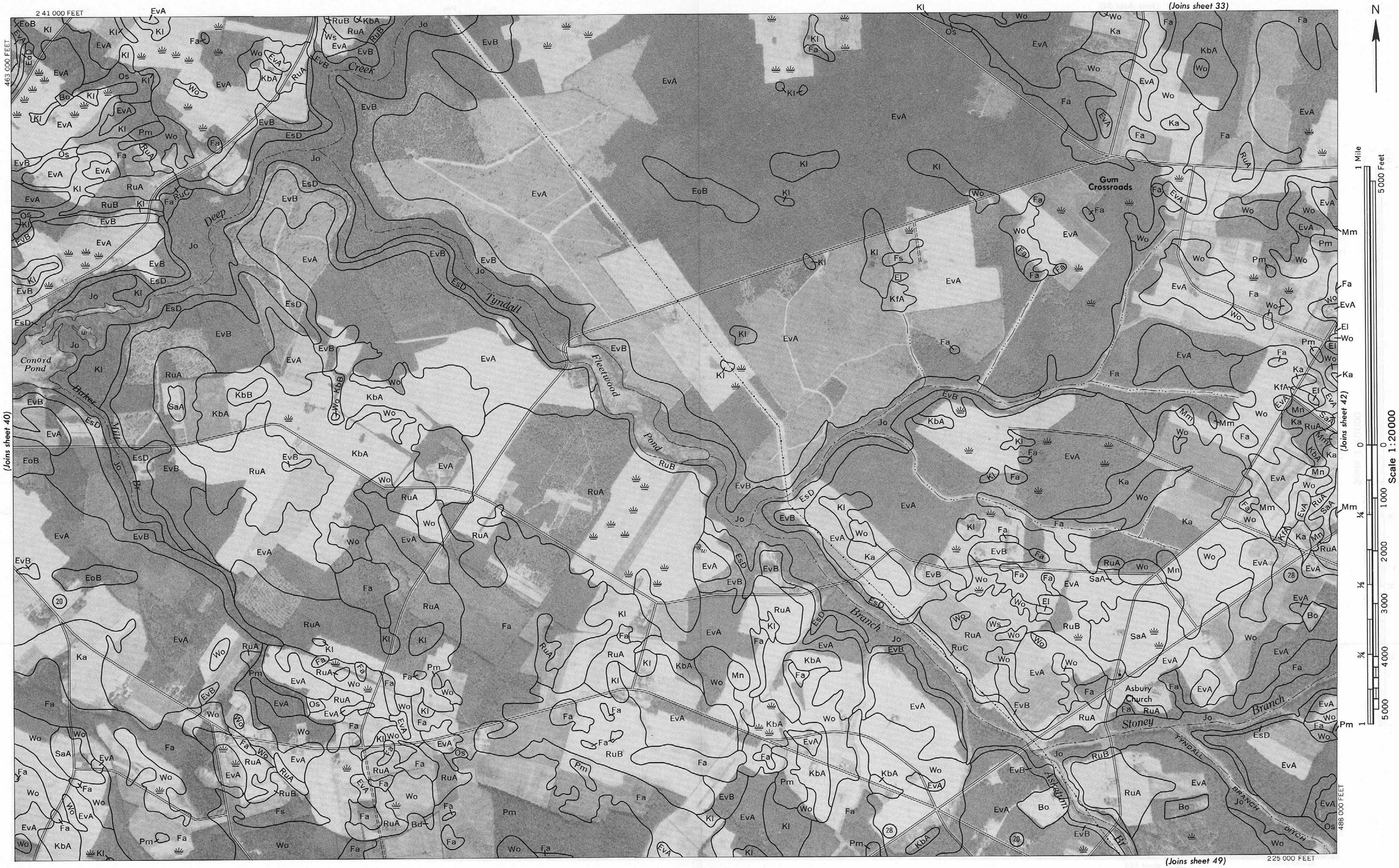
SUSSEX COUNTY, DELAWARE NO. 40



SUSSEX COUNTY, DELAWARE NO. 41

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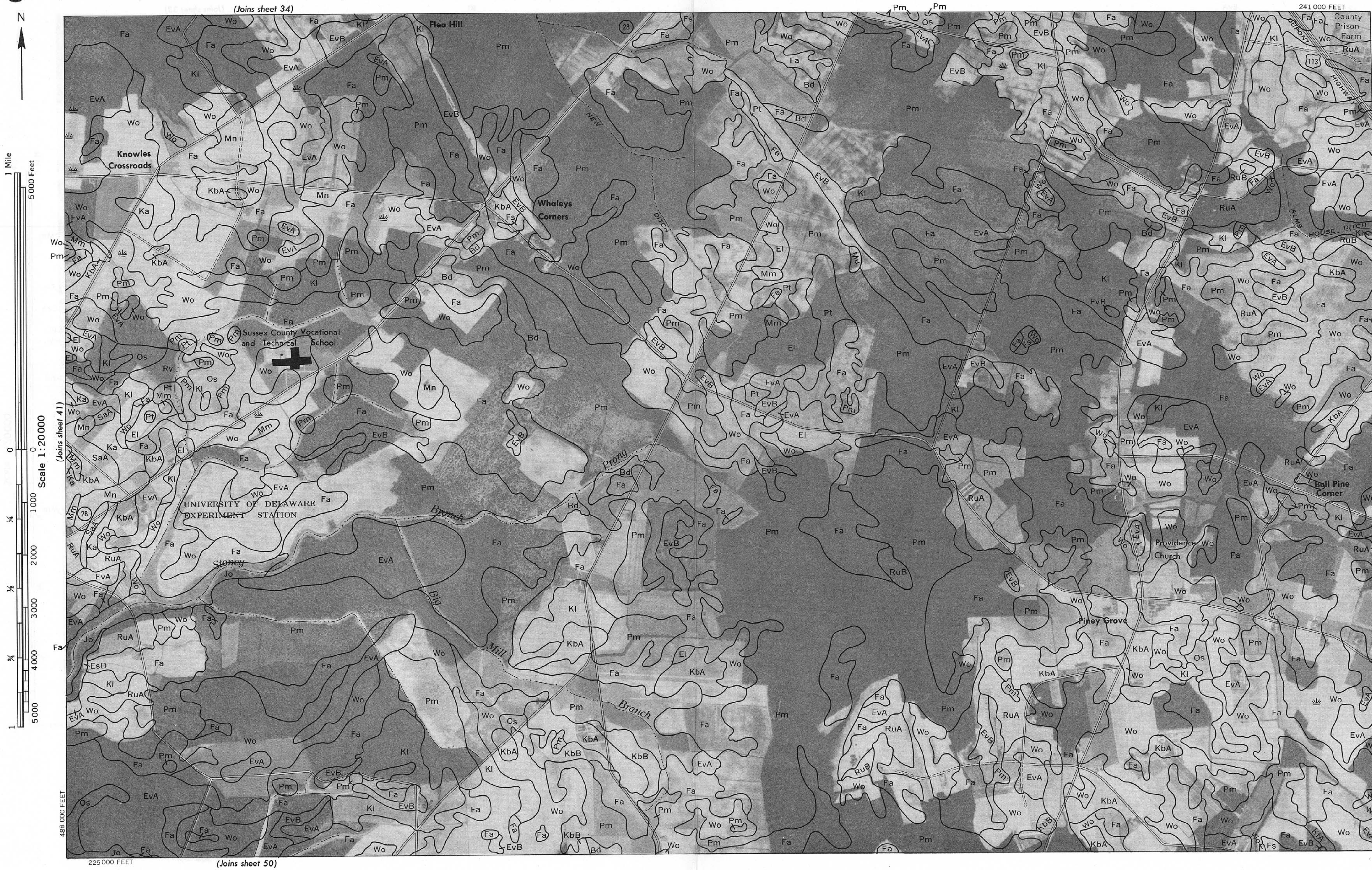
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.



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SUSSEX COUNTY, DELAWARE NO. 43

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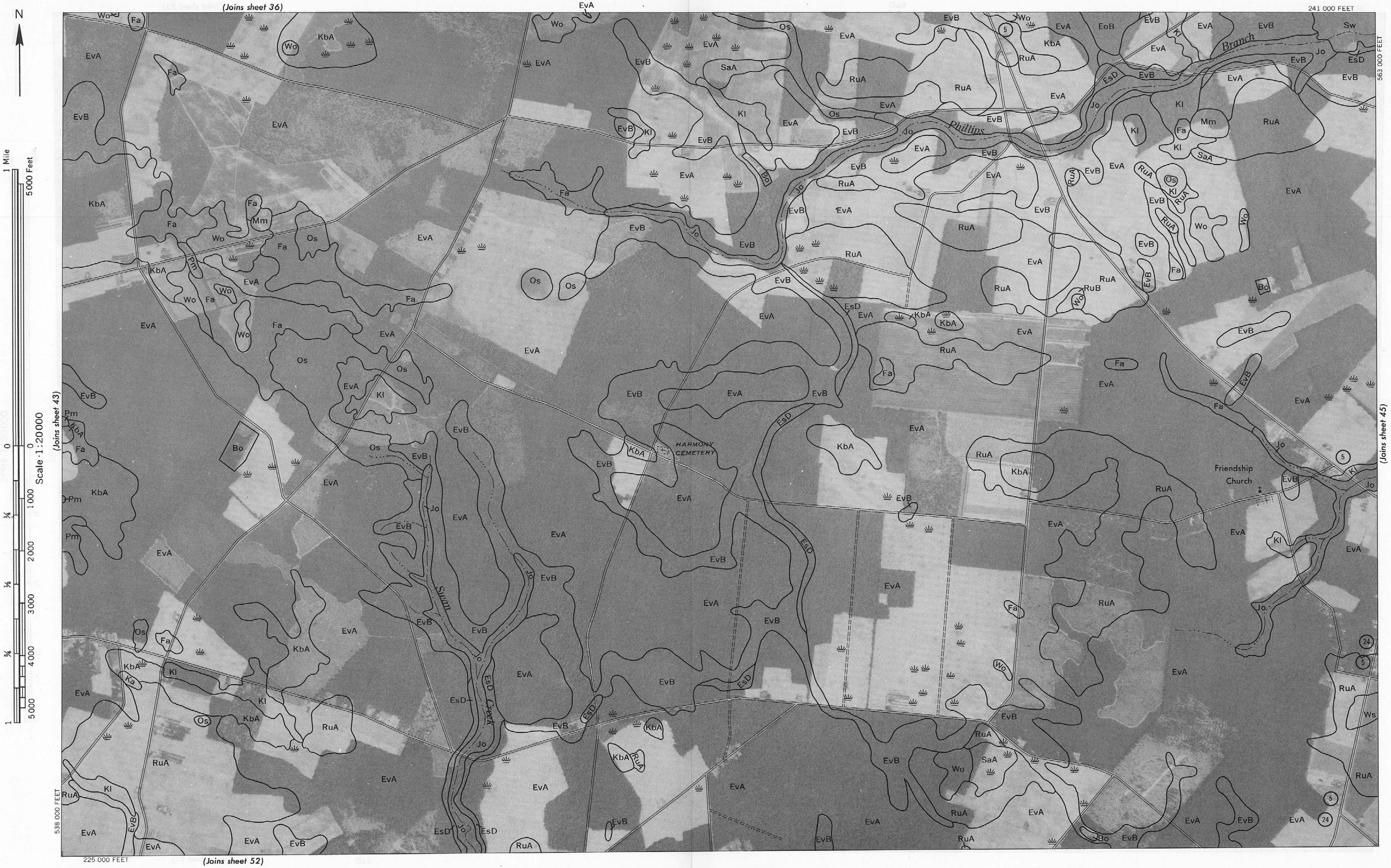

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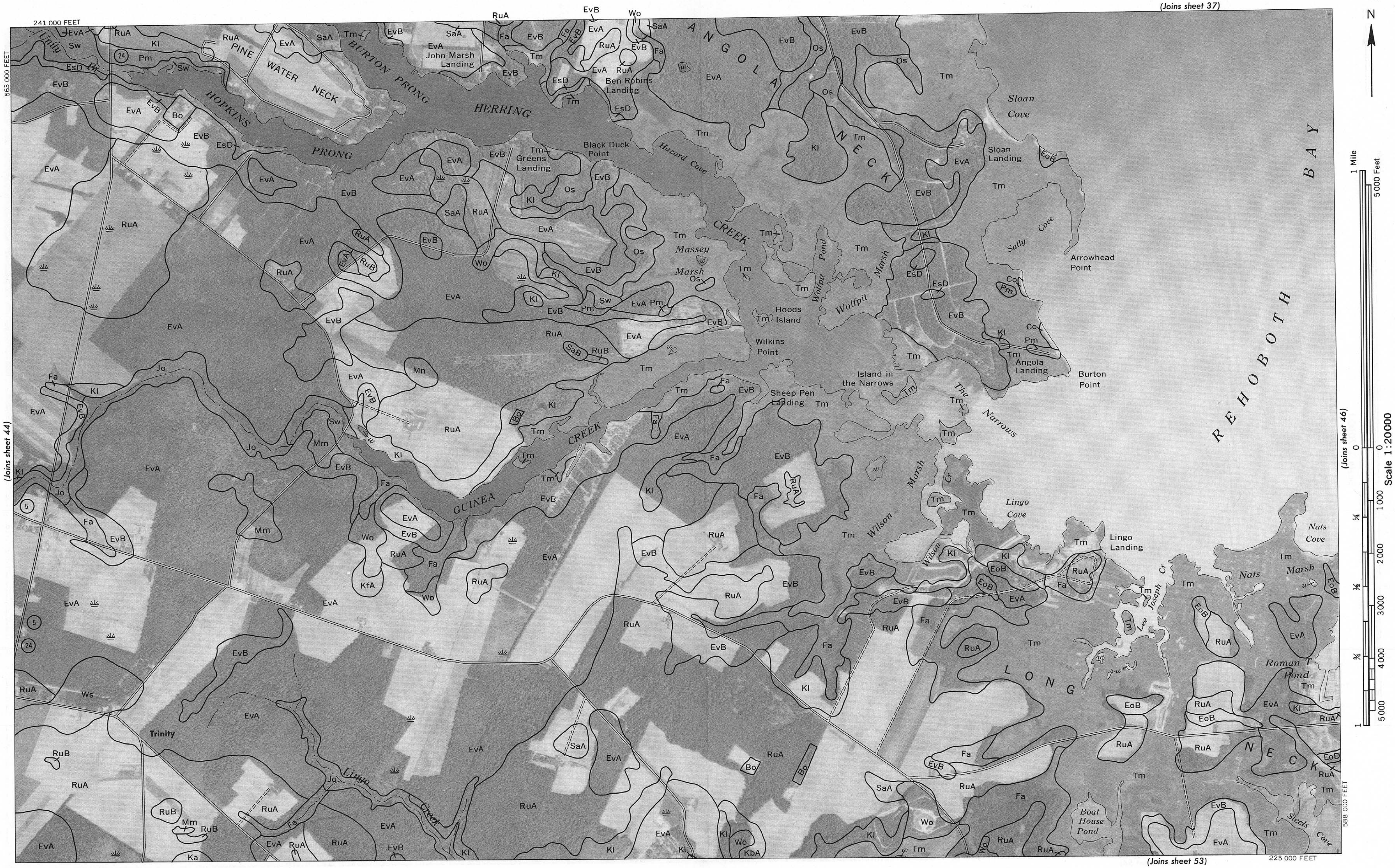
SUSSEX COUNTY, DELAWARE NO. 44



SUSSEX COUNTY, DELAWARE NO. 45

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

N

1 Mile
5000 Feet
Scale 1:20000

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

(Joins sheet 39)

(Joins sheet 48)

(Joins sheet 55)

N

1 Mile
5000 Feet
0
¼
½
¾
1
0
1000
2000
3000
4000
5000
Scale 1:20000

SUSSEX COUNTY, DELAWARE NO. 47

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

N

1 Mile

5000 Feet

Scale 1:20000

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

EoD

EvA

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

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49

SUSSEX COUNTY, DELAWARE NO. 49

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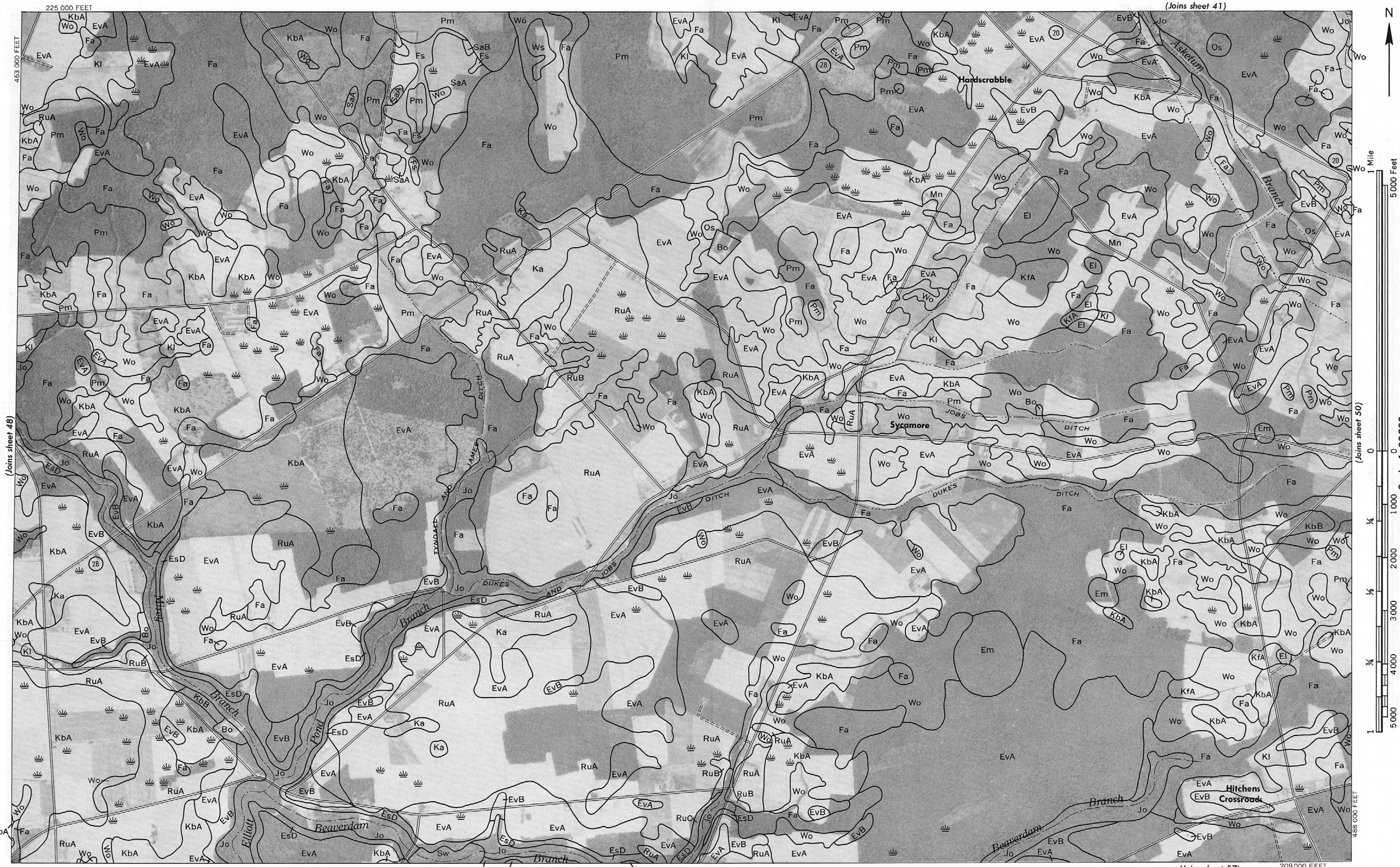
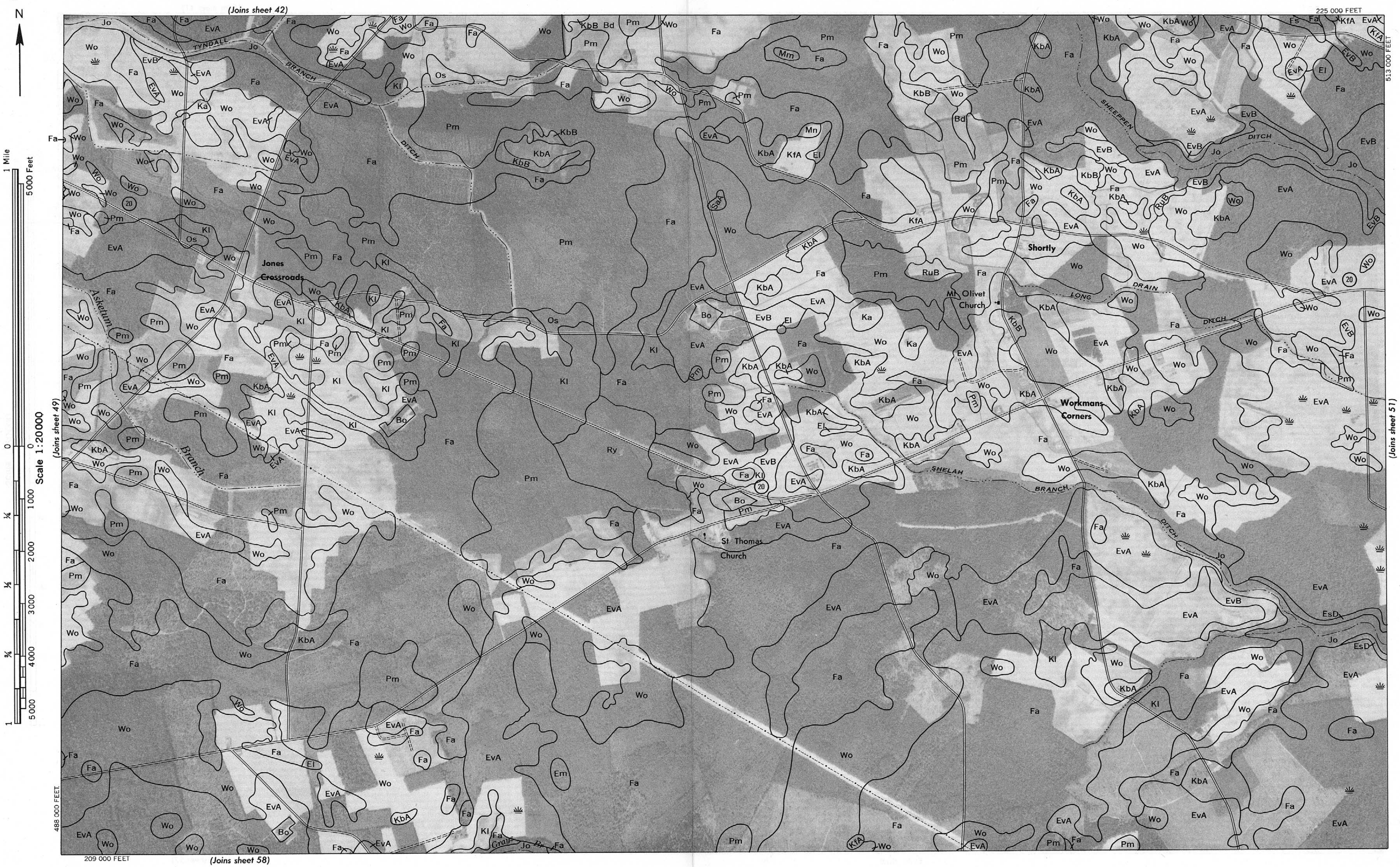
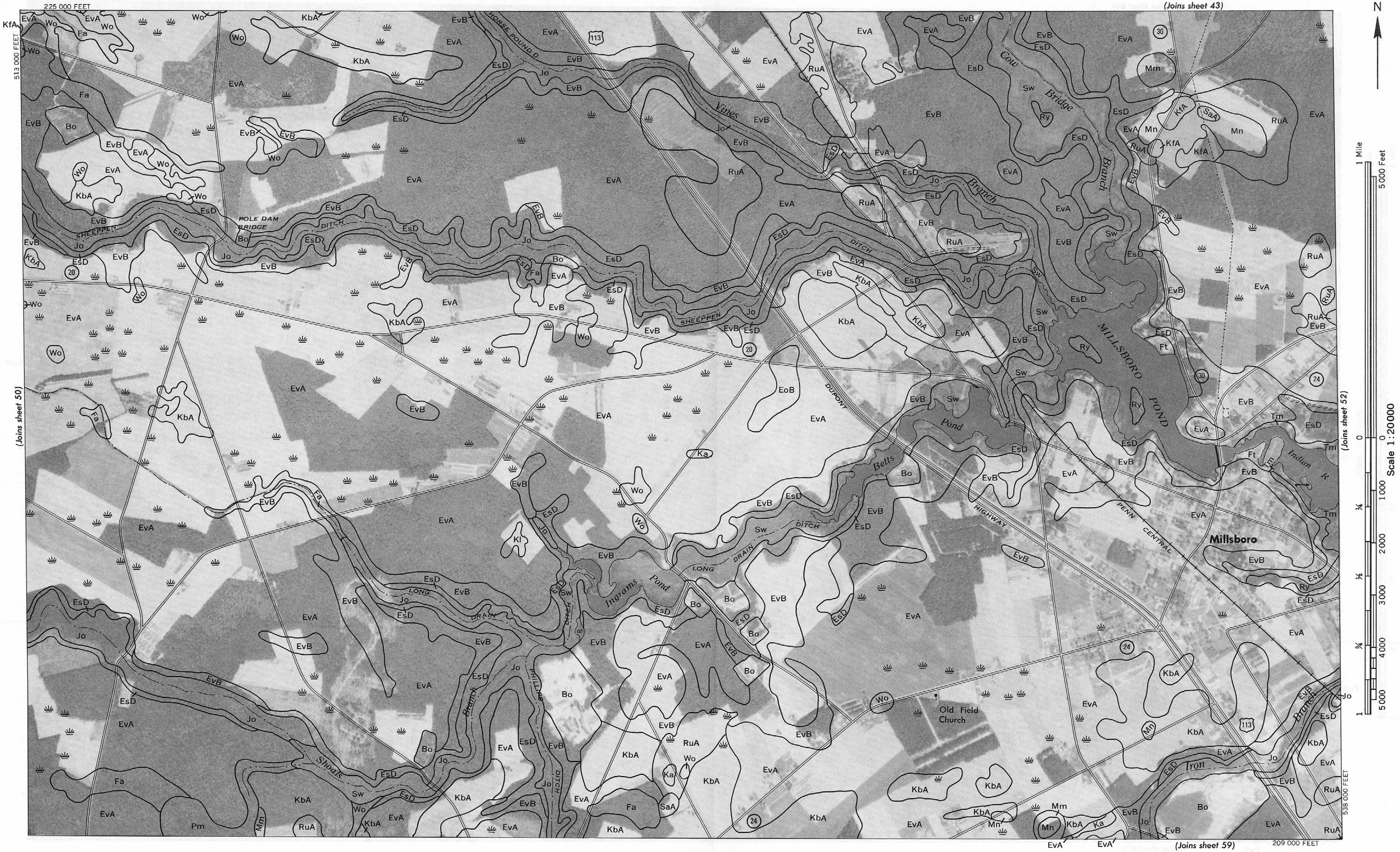




Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

SUSSEX COUNTY, DELAWARE NO. 50



SUSSEX COUNTY, DELAWARE NO. 51

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.
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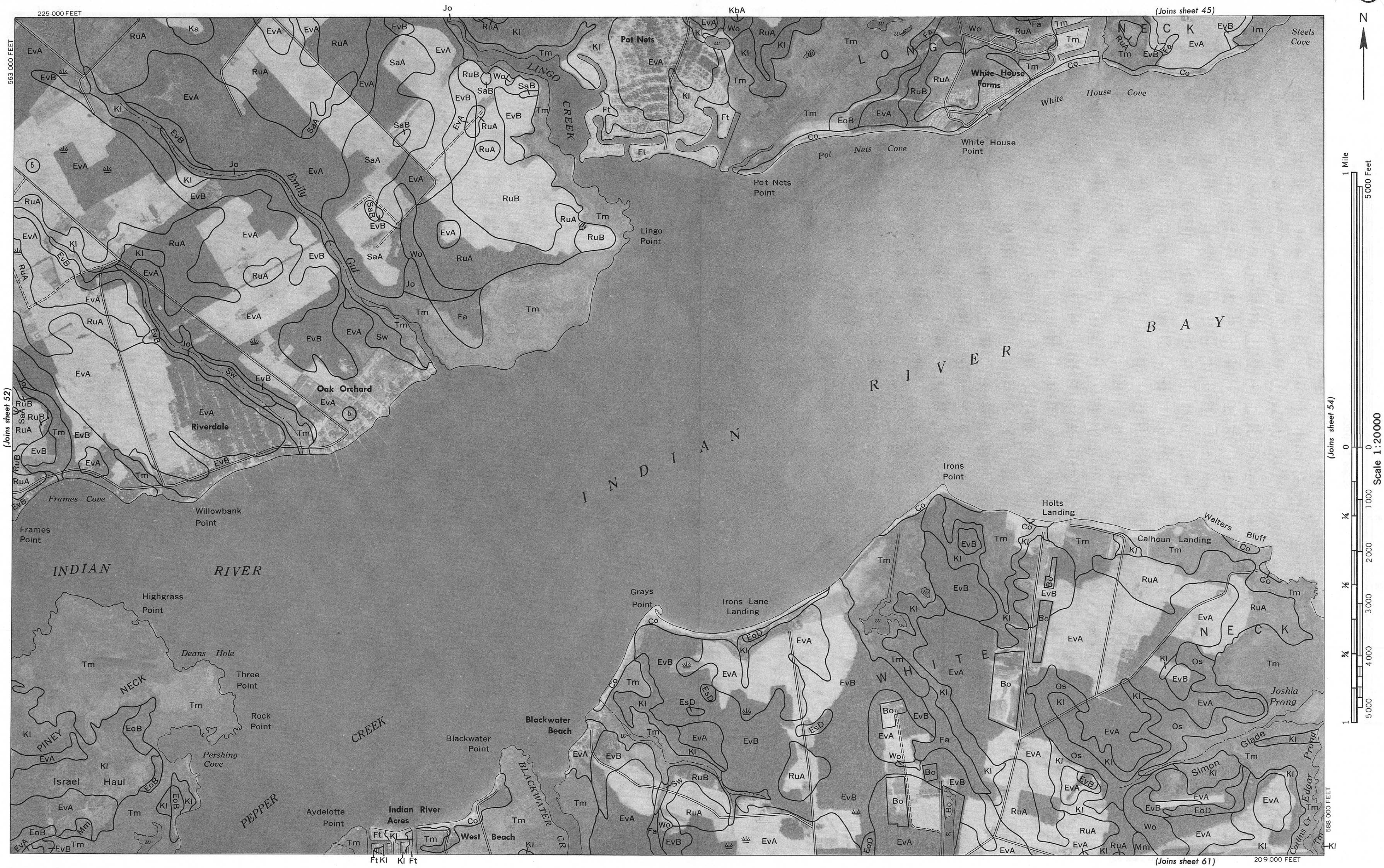
SUSSEX COUNTY, DELAWARE NO. 53

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.



54

N

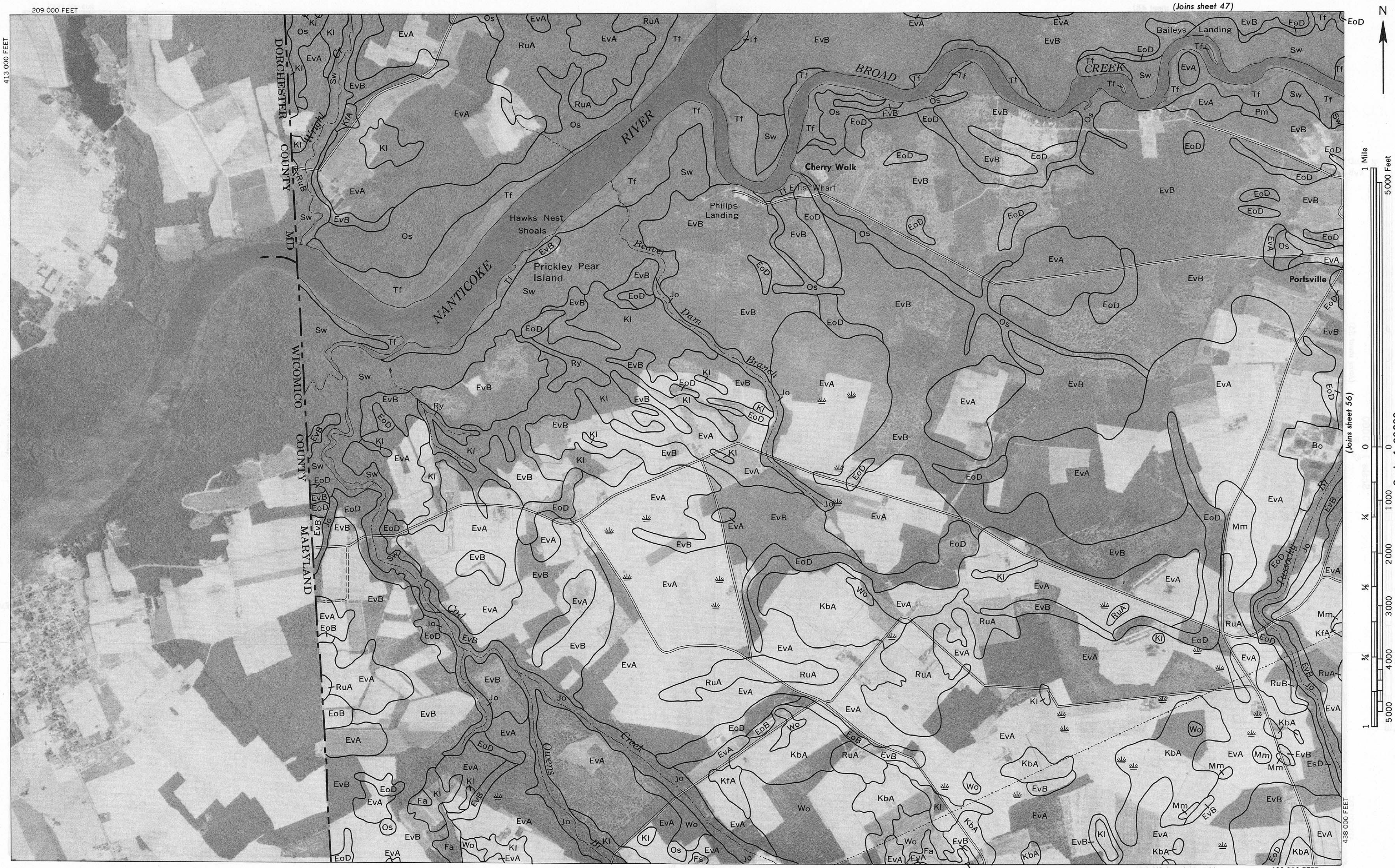
Scale 1:20000

1 Mile ½ ¼ 0

5000 Feet 4000 3000 2000 1000 0

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.



SUSSEX COUNTY, DELAWARE NO. 55

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

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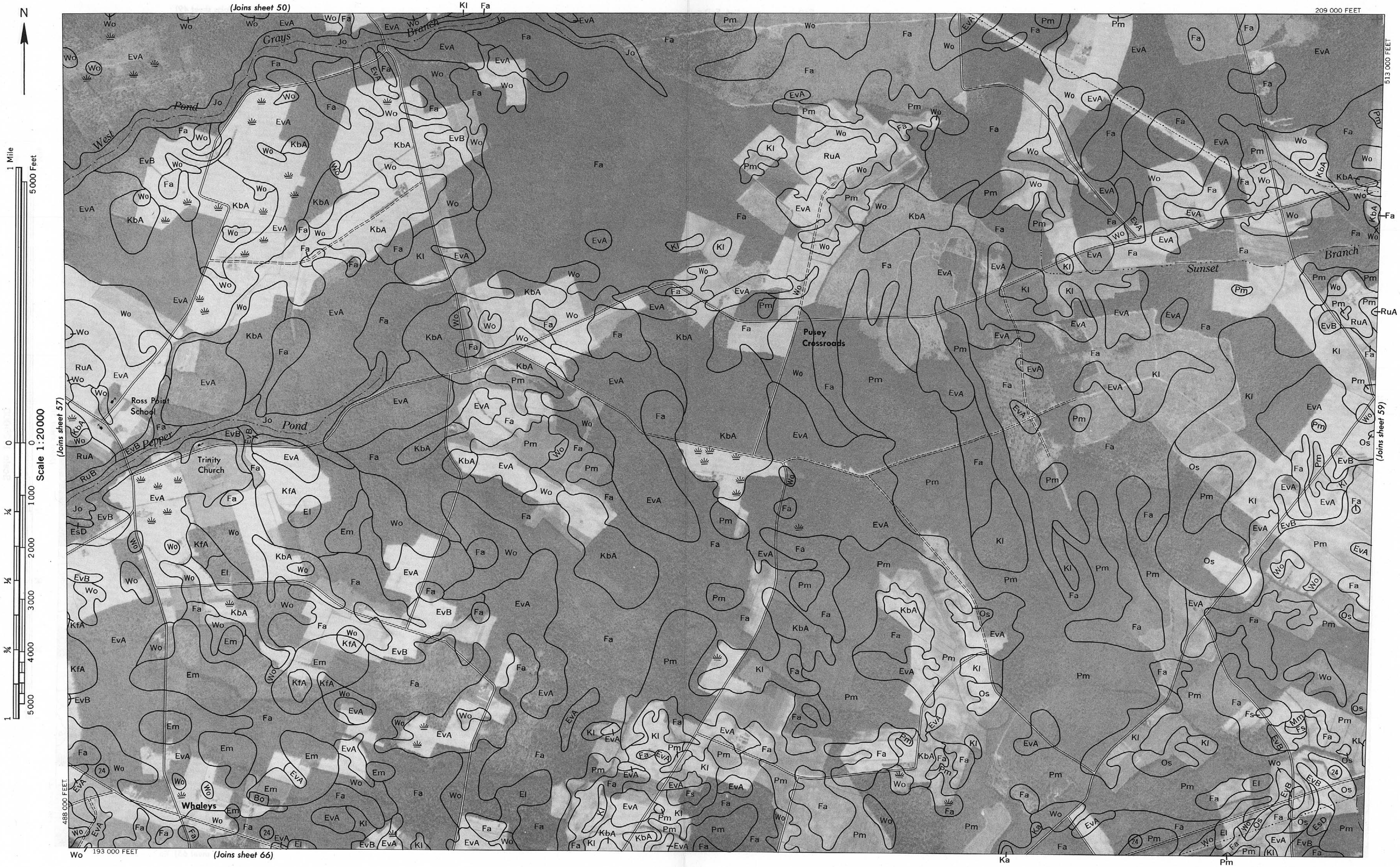
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

SUSSEX COUNTY, DELAWARE NO. 57

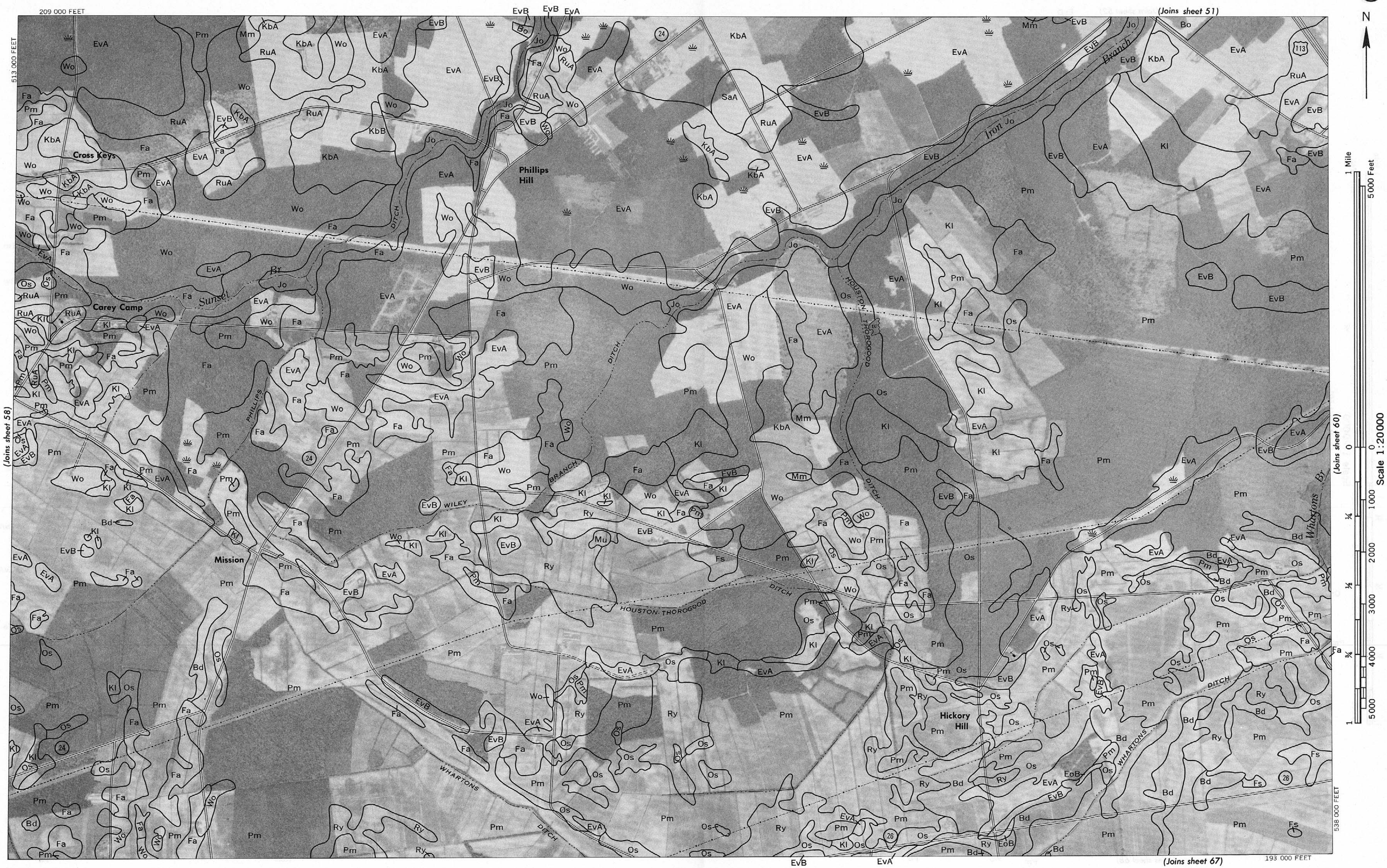
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.



Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

SUSSEX COUNTY, DELAWARE NO. 58



SUSSEX COUNTY, DELAWARE NO. 59

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

SUSSEX COUNTY, DELAWARE — SHEET NUMBER 60

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

SUSSEX COUNTY, DELAWARE NO. 61

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

SUSSEX COUNTY, DELAWARE NO. 63

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station. Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.
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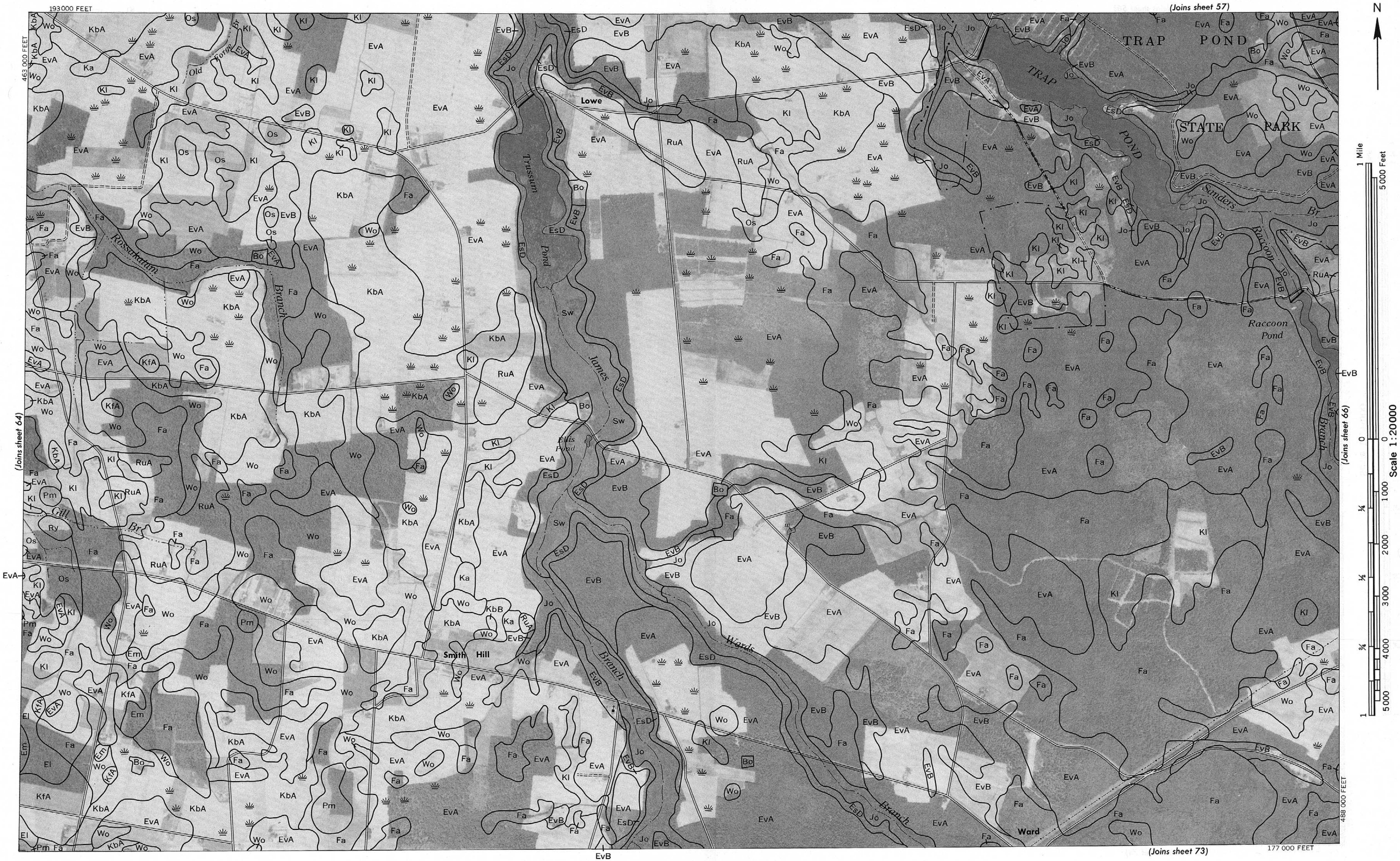
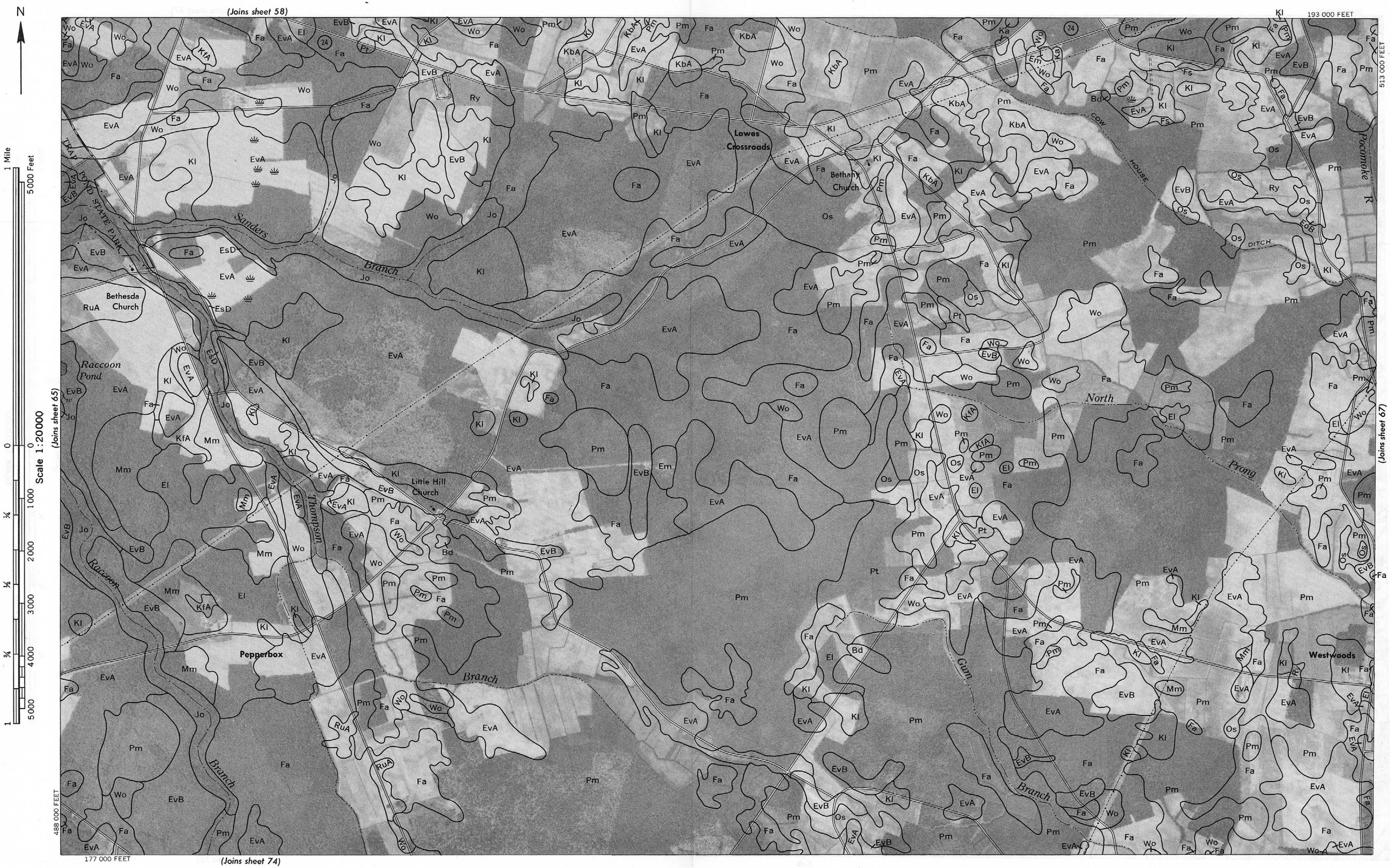
SUSSEX COUNTY, DELAWARE NO. 65

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.





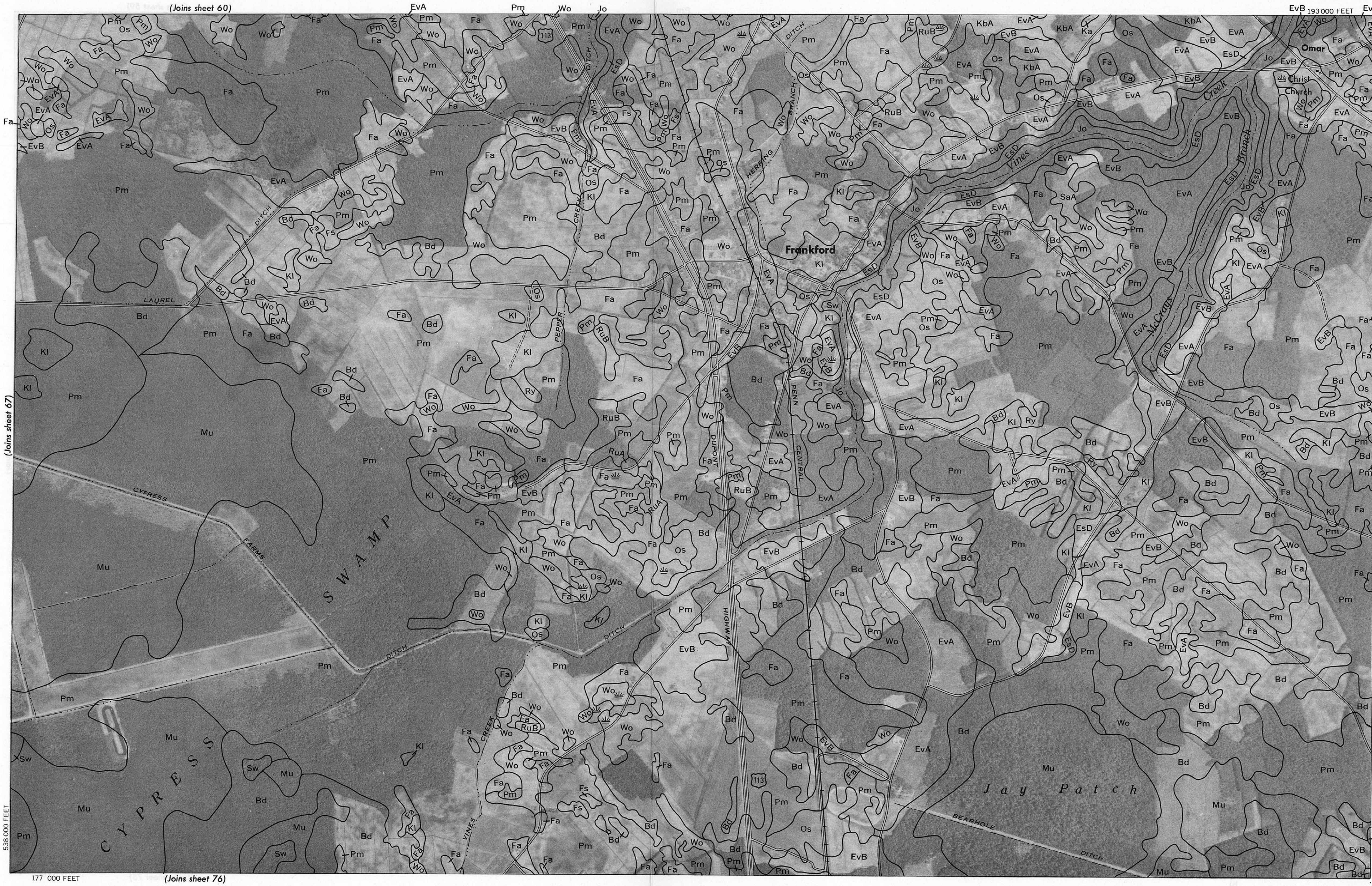
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

SUSSEX COUNTY, DELAWARE NO. 67

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

N

1 Mile
5000 Feet
0
1000
2000
3000
4000
5000
Scale 1:20000



Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

SUSSEX COUNTY, DELAWARE NO. 69

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

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SUSSEX COUNTY, DELAWARE NO. 71

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

SUSSEX COUNTY, DELAWARE — SHEET NUMBER 72

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

N

Scale 1:20000

1 Mile
5000 Feet
0 ¼ ½ ¾ 1
0 1000 2000 3000 4000 5000

SUSSEX COUNTY, DELAWARE NO. 73

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.
Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

SUSSEX COUNTY, DELAWARE — SHEET NUMBER 74

N

Scale 1:20000

1 Mile

5000 Feet

0 1000 2000 3000 4000 5000

0 ¼ ½ ¾ 1

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

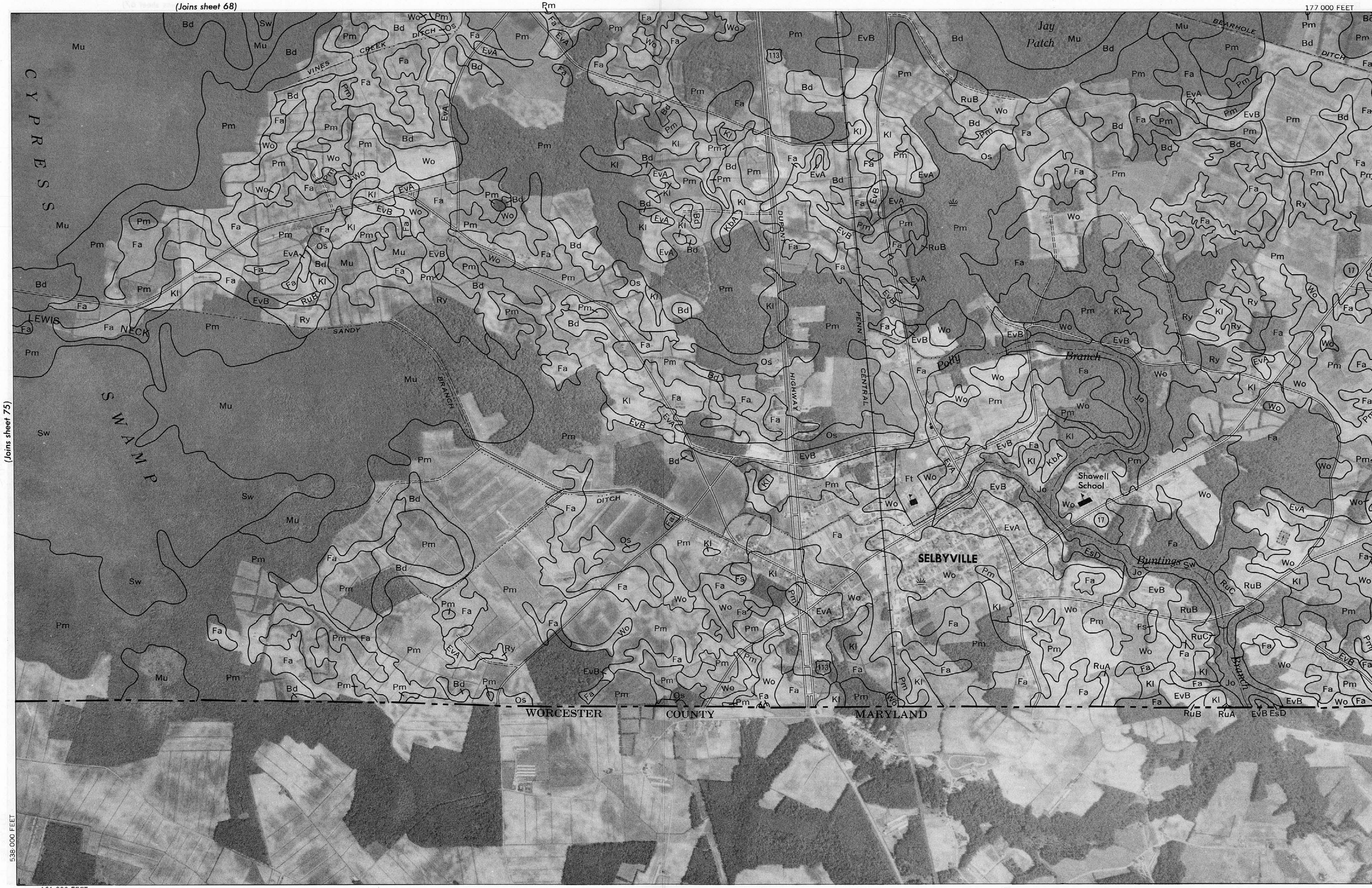
SUSSEX COUNTY, DELAWARE NO. 75

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station. Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

SUSSEX COUNTY, DELAWARE — SHEET NUMBER 76

N

1 Mile
5000 Feet
0
Scale 1:20000
1000
2000
3000
4000
5000



Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.
This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.

SUSSEX COUNTY, DELAWARE NO. 77

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station. Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

N

1 Mile

5000 Feet

Scale 1:20000

(Joins sheet 77)

Photobase from 1970 aerial photography. Positions of grid lines are approximate and based on the Delaware coordinate system.

This map is one of a set compiled in 1971 as part of a soil survey by the United States Department of Agriculture, Soil Conservation Service, and the Delaware Agricultural Experiment Station.